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WAR DEPARTMENT

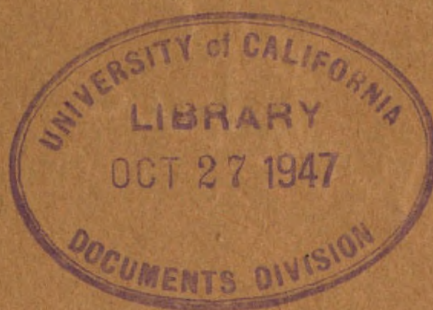
TECHNICAL MANUAL

ORDNANCE MAINTENANCE

**POWER TRAIN, SUSPENSION SYSTEM, HULL,
AND HULL ELECTRICAL SYSTEM FOR
LIGHT CARGO CARRIER T24**

JULY 2, 1943

**CLASSIFICATION CAN-
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Washington, 2 July 1943

ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL,
AND HULL ELECTRICAL SYSTEM FOR
LIGHT CARGO CARRIER T24

Prepared under the direction of the
Chief of Ordnance
(with the cooperation of the Studebaker Corporation)

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CHAPTER 1

INTRODUCTION

	Paragraph
Scope	1
Arrangement	2
Maintenance allocation	3

1. SCOPE.

a. The instructions contained in this manual are for the information and guidance of personnel charged with the maintenance and repair of the Light Cargo Carrier T24. Information on the detailed construction of the unit, disassembly and assembly procedure, inspection, maintenance and repair, is contained in two Technical Manuals of the 1000 series, of which this is volume B. These instructions are supplementary to those in the Field and Technical Manuals prepared for the using arm. This manual does not contain information which is intended primarily for the using arm, since such information is available to ordnance maintenance personnel in 100 series TM's or FM's.

b. This manual contains a description of, and procedure for, removal, disassembly, inspection and repair of the power train, suspension system, hull and hull electrical system.

c. A description of, and procedure for, removal, disassembly, inspection and repair of the engine, engine accessories and clutch is contained in TM 9-1772A.

2. ARRANGEMENT.

a. The subject matter contained in this manual is grouped by chapter, the scope of each being as indicated under "Contents." Because of the complexity and length, chapters have been devoted to the transmission and propeller shaft, axle differential and transmission with final drives, suspension system and the hull and hull electrical system. Sections under various chapters are numbered consecutively within each chapter. Paragraphs are numbered consecutively throughout the manual.

b. Illustrations of specific operations support and clarify the descriptive matter in the text. Exploded views of the component parts of units show the correct relation of related parts, and aid in identification. Figures are numbered consecutively throughout and are located as near as possible to the related text. Frequent references to applicable figures are made throughout the manual.

INTRODUCTION

c. In this manual all references to units or parts as to right or left, and front or rear, are made on the basis of the driver's right, left, front and rear as he sits in the driver's seat facing ahead.

3. MAINTENANCE ALLOCATION.

a. **Scope.** The scope of maintenance and repair by the crew and other units of the using arms is determined by the availability of suitable tools, availability of necessary parts, capabilities of the mechanics, time available, and tactical situation. All of these are variable and no exact system of procedure can be prescribed.

b. **Allocation of Maintenance.** Indicated below are the maintenance duties for which tools and parts have been provided for the using arm personnel. Other replacements and repairs are the responsibility of ordnance maintenance personnel but may be performed by using arm personnel when circumstances permit, within the discretion of the commander concerned. Echelons and words used in this list of maintenance allocations are defined as follows:

SECOND ECHELON:	Line organization regiments, battalions, companies, detachments, and separate companies (first and second echelons).
THIRD ECHELON:	Ordnance light maintenance companies, ordnance medium maintenance companies, ordnance divisional maintenance battalions and ordnance post shops.
FOURTH ECHELON:	Ordnance heavy maintenance companies, and service command shops.
FIFTH ECHELON:	Ordnance base regiments, ordnance bases, arsenals, and manufacturer's plants.
SERVICE: (Including preventive maintenance) paragraph 23 a (1) and (2) AR 850-15.	Consists of servicing, cleaning, lubricating, tightening bolts and nuts, and making external adjustment of subassemblies or assemblies and controls.
REPLACE: Paragraph 23 a (4) AR 850-15.	Consists of removing the part, subassembly or assembly from the vehicles and replacing it with a new or reconditioned or rebuilt part, subassembly or assembly, whichever the case may be.

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REPAIR:

Paragraph 23 a (3)
and (5) in part.
AR 850-15.

Consists of making repairs to, or replacement of the part, subassembly or assembly that can be accomplished without completely disassembling the subassembly or assemblies, and does not require heavy welding, or riveting, machining, fitting and/or alining or balancing.

REBUILD:

Paragraph 23 a (5)
in part and (6)
AR 850-15.

Consists of completely reconditioning and replacing in serviceable condition any unserviceable part, subassembly, or assembly of the vehicle, including welding, riveting, machining, fitting, alining, balancing, assembling and testing.

ECHELONS

2nd 3rd 4th 5th

CLUTCH

Clutch—replace	E	X		
Clutch—repair		X		
Clutch—rebuild			E	X
Controls and linkage—service and/or replace	X			
Controls and linkage—repair		X		
Housing, clutch—replace		X		
Housing, clutch—rebuild			X	

COOLING GROUP

Connections—replace	X			
Radiator assembly—replace	X			
Radiator assembly—repair		X		
Radiator assembly—rebuild			E	X
Shutter assembly—replace	X			
Shutter assembly—repair		X		
System, cooling—service	X			

*The second echelon is authorized to remove and reinstall items marked by an asterisk. However, when it is necessary to replace an item marked by an asterisk with a new or rebuilt part, subassembly or unit assembly, the assembly marked by an asterisk may be removed from the vehicle by the second echelon *only after authority has been obtained from a higher echelon of maintenance.*

Operations allocated will normally be performed in the echelon indicated by "X." Operations allocated to the echelons as indicated by "E" may be accomplished by the respective echelons in emergencies only.

INTRODUCTION

ECHELONS

2nd 3rd 4th 5th

DIFFERENTIAL ASSEMBLY

Band assemblies, brake—service	X			
Band assemblies, brake—replace and/or repair (reline)		X		
Controls and linkage—replace	X			
Controls and linkage—repair		X		
*Differential assembly—replace	*	X		
Differential assembly—repair		X		
Differential assembly—rebuild			E	X

DRIVE, FINAL

Bearings, sprocket wheel—service and/or replace	X			
Drive assembly, final—replace	X			
Drive assembly, final—repair		X		
Drive assembly, final—rebuild			E	X
Hub assemblies—replace	X			
Hub assemblies—repair		X		
Hub assemblies—rebuild			E	X
Retainers, sprocket wheel grease—replace	X			
Shaft, axle—replace	X			
Sprocket and wheel assemblies—replace	X			
Sprocket and wheel assemblies—repair		X		
Sprocket and wheel assemblies—rebuild			E	X

ELECTRICAL GROUP

Battery—service, recharge and/or replace	X			
Battery—repair		X		
Battery—rebuild			E	X
Box, junction—replace	X			
Coil, ignition—replace	X			
Conduits and wiring—replace and/or repair	X			
Defroster assembly—replace	X			
Lamp assemblies—service and/or replace	X			
Lamp assemblies—repair		X		
Regulator, current and voltage—replace	X			
Regulator, current and voltage—service and/or repair		X		
Regulator, current and voltage—rebuild			X	
Switch assemblies—replace	X			
Switch assemblies—repair		X		

*See notes on page 6.

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	ECHELONS			
	2nd	3rd	4th	5th
ENGINE				
Bearings, crankshaft (inserts)—replace		E	E	X
Belt—service and/or replace	X			
Block, cylinder—rebuild (recondition)			E	X
Carburetor assembly—replace	X			
Carburetor assembly—repair		X		
Carburetor assembly—rebuild			X	
Cleaner, air—service and/or replace	X			
Cleaner, air—repair		X		
Condenser, distributor—replace	X			
Controls and linkage—service and/or replace	X			
Controls and linkage—repair		X		
Crankshaft—rebuild (recondition)			E	X
Distributor assembly—service and/or replace	X			
Distributor assembly—repair		X		
Distributor assembly—rebuild			X	
*Engine assembly—replace	*	X		
Engine assembly—repair		X		
Engine assembly—rebuild			E	X
Fan assembly—replace	X			
Fan assembly—repair		X		
Fan assembly—rebuild			X	
Filter assembly, oil—service and replace cartridge	X			
Filter assembly, oil—repair		X		
Flywheel—replace and/or repair		X		
Flywheel—rebuild (recondition)			E	X
Gaskets, cylinder head and manifold—replace	X			
Gear train, timing—replace		X		
Generator assembly—replace	X			
Generator assembly—repair		X		
Generator assembly—rebuild			X	
Head, cylinder—replace and/or repair		X		
Lines and connections, oil (external)—replace	X			
Lines and connections, oil (external)—repair		X		
Lines and connections, oil (internal)—replace and/or repair		X		
Manifolds—replace	X			
Manifolds—repair		X		

*See notes on page 6.

INTRODUCTION

ECHELONS

2nd 3rd 4th 5th

ENGINE (Cont'd)

Motor assembly, starting—replace and/or repair	X			
Motor assembly, starting—rebuild			X	
Pan assembly, oil—service and replace gaskets . .		X		
Pan assembly, oil—repair and/or replace		X		
Pistons and rings—replace		E	E	X
Plugs, spark—service and/or replace	X			
Plugs, spark (two-piece)—repair		X		
Points, breaker, distributor—replace	X			
Pump assembly, fuel—replace and/or repair		X		
Pump assembly, fuel—rebuild			X	
Pump assembly—oil—replace and/or repair		X		
Pump assembly, oil—rebuild			X	
Pump assembly, water—replace	X			
Pump assembly, water—repair		X		
Pump assembly, water—rebuild			X	
Rods, connecting—replace		E	E	X
Thermostat—replace	X			
Valves—service		X		
Ventilator, crankcase—service and/or replace . .	X			
Wiring, ignition—replace	X			

EXHAUST GROUP

Muffler and exhaust pipes—replace	X
---	---

EXTINGUISHER, FIRE

Extinguisher, fire (carbon tetrachloride CCl_4) service (refill) and/or replace	X			
Extinguisher, fire (carbon tetrachloride CCl_4) —repair		X		
Extinguisher, fire (carbon tetrachloride CCl_4) —rebuild			E	X

FUEL GROUP

Filter assembly, fuel—service and/or replace . . .	X			
Filter assembly, fuel—repair		X		
Lines and connections—replace	X			
Lines and connections—repair	E	X		
Pump assembly, primer—replace	X			
Pump assembly, primer—repair		X		

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	ECHELONS			
	2nd	3rd	4th	5th
FUEL GROUP (Cont'd)				
Pump assembly, primer—rebuild			X	
Tank, service and/or replace	X			
Tank—repair		X		
HULL				
Bows—replace	X			
Bows—repair		X		
Hull—repair		X		
Hull—rebuild			E	X
Pintle assembly—replace	X			
Pintle assembly—repair		X		
Pintle assembly—rebuild			X	
Seats—replace	X			
Seats—repair		X		
Tarpaulin—replace	X			
Tarpaulin—repair		E	X	
Windshield assembly—replace	X			
Windshield assembly—repair		X		
Wiper assemblies, windshield—replace	X			
Wiper assemblies, windshield—repair	E	X		
Wiper assemblies, windshield—rebuild			X	
INSTRUMENTS				
Instruments—replace	X			
Instruments—repair		X		
Instruments—rebuild			E	X
SHAFTS, PROPELLER				
Shaft assemblies, propeller (w/universal joints) —replace	X			
Shaft assemblies, propeller (w/universal joints) —repair		X		
Shaft assemblies, propeller (w/universal joints) —rebuild			E	X
SUSPENSION GROUP				
Arm, idler—replace	X			
Arm, idler—repair		X		
Arm, idler—rebuild			E	X

See notes on page 6.

INTRODUCTION

ECHELONS

2nd 3rd 4th 5th

SUSPENSION GROUP (Cont'd)

Arm, idler support—replace	X			
Arm, idler support—repair		X		
Arm, idler support—rebuild			E	X
Bearings, idler wheel—service and/or replace	X			
Bogie, components—replace	X			
Bogie, components—repair		X		
Bogie, components—rebuild			E	X
Retainers, idler wheel grease—replace		X		
Roller assemblies, track support—replace	X			
Roller assemblies, track support—repair		X		
Roller assemblies, track support—rebuild			E	X
Spring assemblies, suspension—replace	X			
Spring assemblies, suspension—repair		X		
Spring assemblies, suspension—rebuild			E	X
Track assemblies—replace	X			
Track assemblies—repair		X		
Wheel assemblies—replace	X			
Wheel assemblies—repair		X		
Wheel assemblies—rebuild			E	X

TRANSMISSION

Controls and linkage—service and/or replace	X			
Controls and linkage—repair		X		
*Transmission assembly—replace	*	X		
Transmission assembly—repair		X		
Transmission assembly—rebuild			E	X

VEHICLE ASSEMBLY

Carrier assembly—service	X			
Carrier assembly—rebuild (with serviceable unit assemblies)			X	E

*See notes on page 6.

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CHAPTER 2

**TRANSMISSION AND PROPELLER SHAFT WITH
UNIVERSAL JOINTS**

Section I

TRANSMISSION DESCRIPTION AND DATA

	Paragraph
Description and operation	4
Data	5

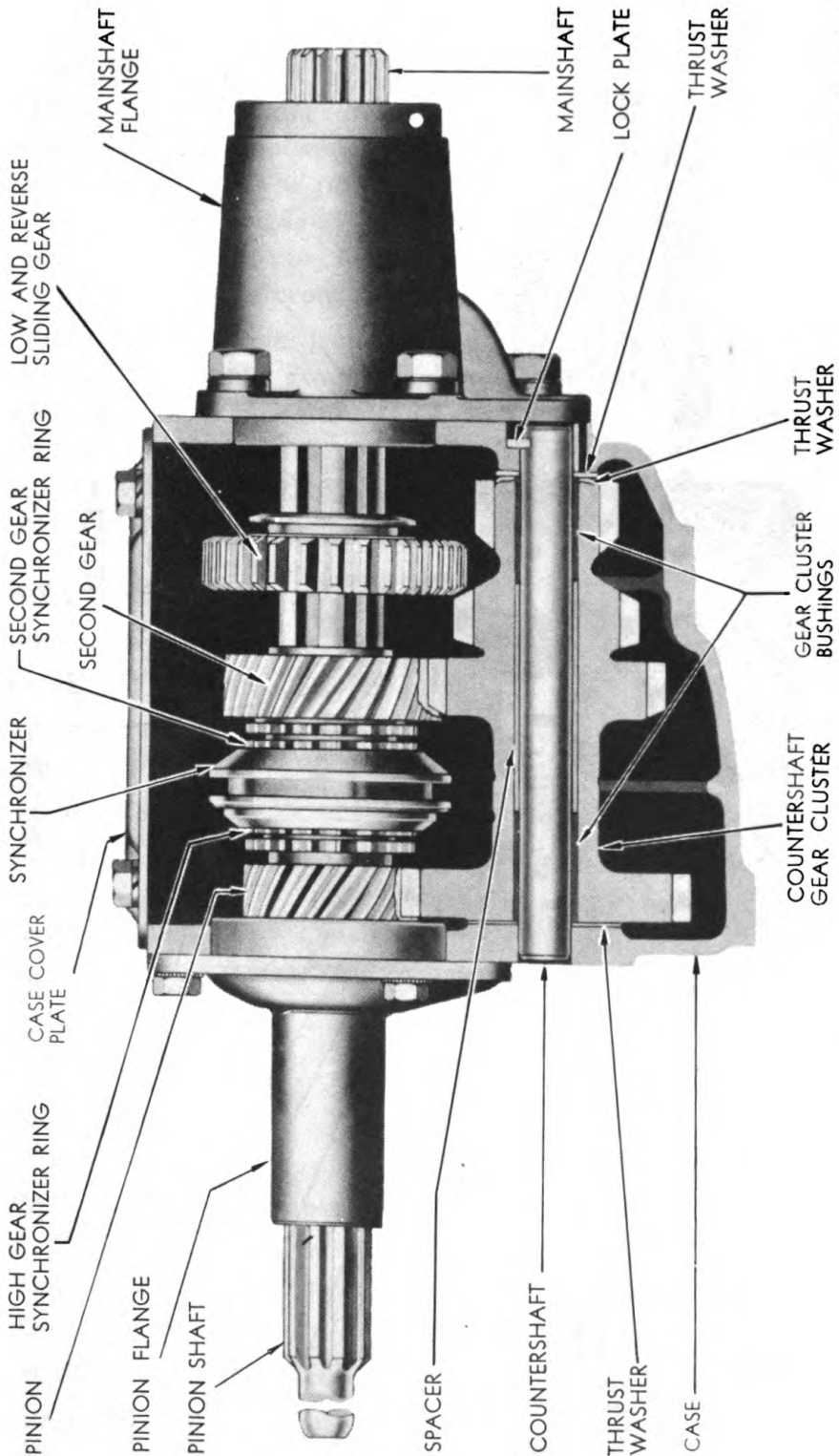
4. DESCRIPTION AND OPERATION.

a. The function of the transmission unit is to provide a means of transferring engine torque to the vehicle driving tracks at variable engine and track speed ratios. The several transmission gears, operating shafts, shifting mechanism, and bearings are contained in a cast-iron case having a lubricant filler plug and a drain plug. A cover plate is located on the top of the case, a mainshaft flange at the rear, and a pinion flange at the front. Two shift levers are mounted externally on the left side of the transmission case.

b. The transmission has three forward speeds and one reverse. Power enters at the front end of the transmission through the transmission pinion from the clutch driven member, the hub of which is carried on the pinion shaft splines. The pinion is supported at its rear end by a ball bearing and at the front by a bushing in the flywheel hub. Just inside the front wall of the transmission case the power is transmitted to the transmission countershaft cluster gear. The cluster is carried on bronze bushings that bear on the countershaft which is locked stationary in the case. The countershaft gear cluster and the transmission pinion are in motion at all times when the engine is operating and the clutch is engaged (fig. 2).

c. A splined mainshaft, a synchronizer unit, and a sliding gear, together with two shifting forks and mechanism, complete the transmission unit. The mainshaft is supported at the rear by a ball bearing, while the front end turns on bearing rollers recessed in the rearward end of the pinion. Movement of either the synchronizer or the sliding gear is controlled by the transmission remote control shift lever located at the front of the cockpit immediately ahead of the driver's seat. The position of the synchronizer or sliding gear can be changed by moving the control lever and linkage to engage the first speed combination, second or third speed gearing, or the reverse gear combination. When the shift to high gear

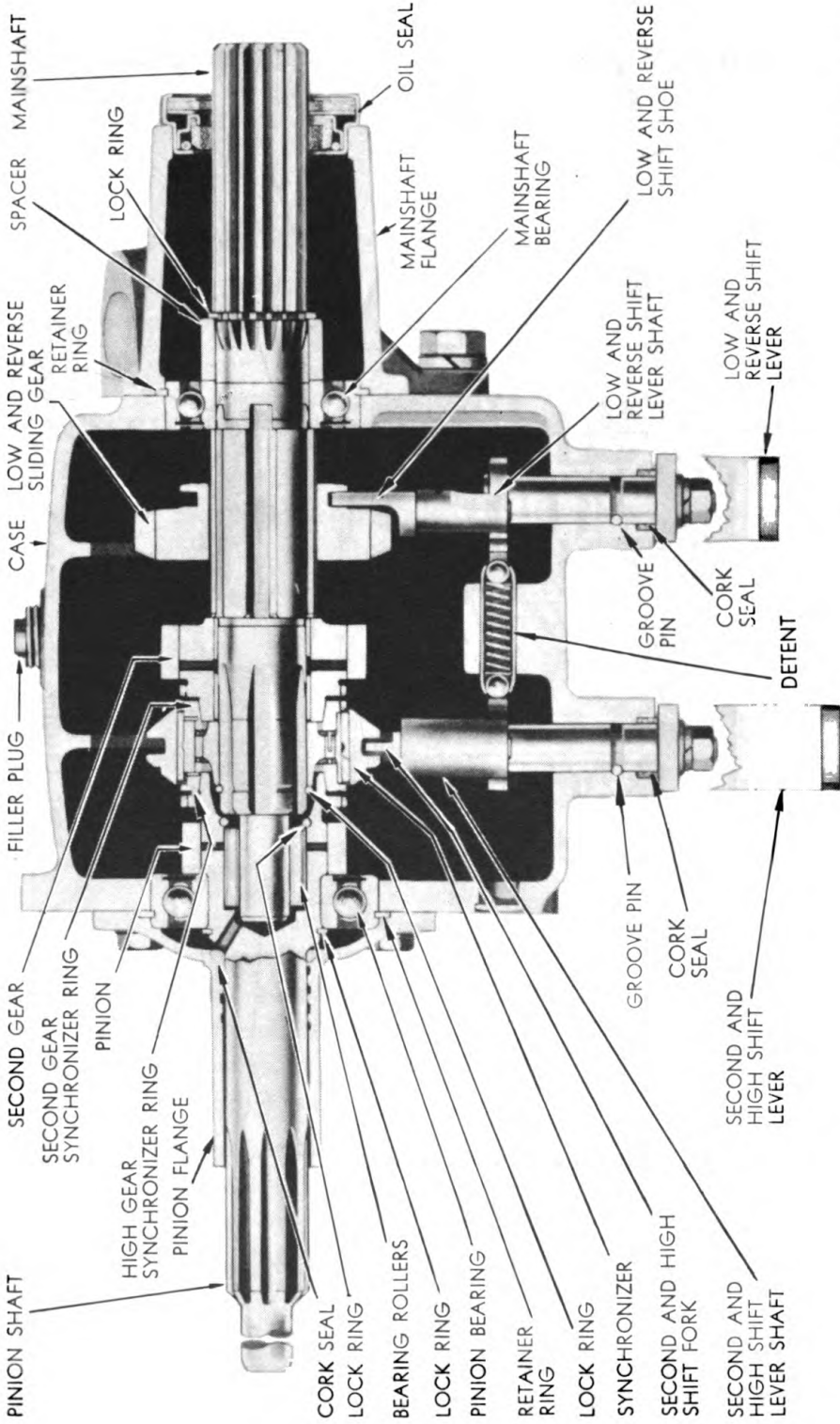
TRANSMISSION DESCRIPTION AND DATA



RA PD 66892

Figure 1—Transmission—Side Cut Away

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RA PD 66987

Figure 2—Transmission—Top Cross Section

TRANSMISSION DESCRIPTION AND DATA

(third speed) is made, the synchronizer moves to the front to engage the small spur teeth of the pinion. The drive through the countershaft gears is eliminated entirely in this position because the mainshaft is connected directly with the engine clutch.

d. The second and high gear combination is fitted with synchronizing rings to permit shifting between second and high, or vice versa, without gear tooth interference. The reverse direction of motion is accomplished through an idler gear engaged with the small gear of the cluster. The sliding gear engages with the idler gear when a shift is made into reverse. The idler gear turns on a bronze bushing in its hub.

e. The splined rearward end of the mainshaft is connected to the propeller shaft through a ground and splined sleeve or slip joint with yoke, which is free to move ahead or rearward as required, due to the movement of the cushion-mounted engine. The outer ground surface of the slip joint bears against a spring-loaded leather seal to prevent the escape of oil at the rearward end of the transmission case.

5. DATA.

Make Warner
Model T-84-J
Type Synchromesh
Speeds..... 3 forward, 1 reverse
Helical gears..... 2nd speed and constant mesh
Synchronizers..... 2nd and high speeds
Ratios:

1st 2.66
2nd 1.56
3rd 1 to 1
Reverse 3.55

Pinion bearing:

Type Ball
Manufacturer's Number..... MRC-207SFG or
SKF-6207-ZN
Bore 1.3775-in.
Outside Diameter 2.8340-in.
Width 0.6643-in.

Mainshaft front bearing:

Type Ball
Manufacturer's Number MRC-206SFG or
SKF-6206-ZN

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Section II

TRANSMISSION TROUBLE SHOOTING AND TEST

	Paragraph
Trouble shooting	6

6. TROUBLE SHOOTING.

a. Noisy in Neutral.

Possible Cause	Possible Remedy
Misalinement of transmission with engine assembly.	Aline clutch housing to engine front plate and aline transmission to clutch housing.
Transmission pinion bearing rough, damaged, or dirty.	Clean or replace as required.
Transmission constant mesh gears scuffed, chipped, butted or improperly machined.	Replace as required.
Transmission countershaft bushings scored, dirty, or rough.	Clean or replace as required.
Transmission mainshaft second speed gear bushing rough, scored, or damaged.	Clean or replace mainshaft with gears assembly.
Transmission constant mesh gears not properly meshed.	Replace with a complete set.
Reverse idler gear shaft or bushing rough, scored, or damaged.	Replace as required.
Reverse idler gear, scuffed, chipped, burred, or improperly machined.	Replace.
Eccentric second speed constant mesh gear.	Replace mainshaft with gears assembly.
Too much lash in constant mesh gear train.	Replace parts as required.
Abnormal end play of countershaft gear cluster, reverse idler gear, or pinion.	Replace parts as required.
Transmission mainshaft pilot bearing rollers badly damaged or broken.	Replace.
Insufficient lubricant in transmission.	Fill to recommended level.
Incorrect grade or dirty transmission lubricant.	Drain, flush transmission, and replace lubricant.

TRANSMISSION TROUBLE SHOOTING AND TEST**b. Noisy in Gear.**

Possible Cause	Possible Remedy
Transmission mainshaft front bearing rough, damaged, or dirty.	Clean or replace as required.
Transmission sliding gear teeth rough, burred, scuffed, pitted, chipped, or tapered.	Replace mainshaft with gears assembly.
Excessive clearance or end play of mainshaft second speed gear on mainshaft.	Replace mainshaft with gears assembly.

c. Oil Leaks.

Lubricant level too high in transmission case.	Drain to proper level.
Damaged, improperly installed, or missing gaskets.	Replace or install properly as required.
Damaged or improperly installed oil seals.	Replace or reinstall as required.
Transmission case drain or filler plug loose or threads damaged.	Tighten or replace plug as necessary.
Transmission case bolts loose, missing, or threads stripped.	Tighten or replace bolts.
Sand hole or crack in transmission case.	Replace transmission case.
Use of a lubricant which foams excessively.	Drain, flush, and refill transmission with recommended lubricant.

d. Difficult to Shift into Gear.

Failure to completely disengage clutch.	Inspect clutch pedal and linkage for freedom and maximum travel, or correct faulty shifting habit.
Synchronizer sleeve fits too tightly on synchronizer gear.	Replace synchronizer assembly.
Insufficient chamfer on sliding gear teeth.	Replace mainshaft with gears assembly.
Mainshaft splines distorted, butted, or damaged.	Replace mainshaft assembly.
Sliding gear tight on mainshaft splines.	Free members or replace mainshaft with gears assembly as required.
Improper adjustment or bent remote control linkage.	Adjust, reform, replace as required.
Lubricant too heavy or cold.	Change to proper grade.

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e. Sticks in Gear.

Possible Cause	Possible Remedy
Engine clutch not completely disengaged.	Check clutch adjustment and release mechanism.
Insufficient chamfer at edge of gearshift lever cam poppet ball notches.	Replace parts as required.
Sliding gear tight on mainshaft.	Free or replace mainshaft with gears assembly.
Distorted, butted, or damaged mainshaft splines.	Replace mainshaft with gears assembly.
Improper adjustment or bent remote control linkage.	Adjust, reform, or replace as required.

f. Slips Out of High Gear.

Misalignment of transmission with engine.	Aline clutch housing to engine front plate and transmission to clutch housing as required.
Transmission pinion gear teeth tapered.	Replace pinion.
Synchronizer sleeve or ring teeth damaged or tapered.	Replace synchronizer assembly.
Insufficient poppet spring tension on gearshift lever cam notch.	Replace poppet.
Excessive chamfer on edge of gearshift lever cam notches.	Replace shift lever.
Improper adjustment or bent remote control linkage.	Adjust, reform, or replace parts involved.
Abnormal end play of second speed constant mesh on mainshaft.	Replace parts as required.
Synchronizer sleeve or ring teeth tapered, or distorted.	Replace synchronizer assembly.
Excessive chamfer on edge of gearshift lever cam notch.	Replace shift lever.
Improper adjustment of remote control rods.	Adjust, reform, or replace parts involved.

g. Slips Out of First and Reverse Gear.

First and reverse sliding gear loose on mainshaft splines.	Replace mainshaft with gears assembly.
First and reverse sliding gear teeth damaged or tapered.	Replace mainshaft with gears assembly.
Mainshaft splines distorted.	Replace mainshaft with gears assembly.

TRANSMISSION TROUBLE SHOOTING AND TEST

Possible Cause	Possible Remedy
Countershaft first speed gear teeth damaged or tapered.	Replace gear cluster.
Excessive end play of countershaft gear cluster.	Replace parts as required.
Reverse idler gear teeth damaged or tapered.	Replace gear.
Excessive end play of reverse idler gear in transmission case.	Replace parts as required.
Too much chamfer on edge of gearshift lever cam notch.	Replace shift lever.
Gearshift lever cam notch not machined sufficiently deep.	Replace shift lever.
Improper adjustment of remote control rods.	Adjust, reform, or replace parts involved.
Transmission locks in two gears at once.	See "Note."

NOTE: Where operating difficulties involve the remote control shift rods and linkage, the adjustment and rate of wear on the engine mountings affect the relative position of the engine to permit movement which may change the control linkage adjustment.

h. Diagnosis. Most noises emanating from the transmission will not be audible with the vehicle in motion because of the various other operating noises. However, a preliminary operating check on the transmission may be obtained by first disengaging the axle unit (axle transmission shift lever in neutral). With the engine running, shift the transmission into low, second, high, and reverse gears respectively. In each position, run the engine at various speeds and listen carefully for unusual noises. It is possible that the investigation will disclose a noise caused by another part of the drive line; such as from worn universal joint needle bearings, loose universal joints, a bent or otherwise misaligned propeller shaft, or a faulty clutch.

Section III

TRANSMISSION REMOVAL

	Paragraph
Remove transmission	7

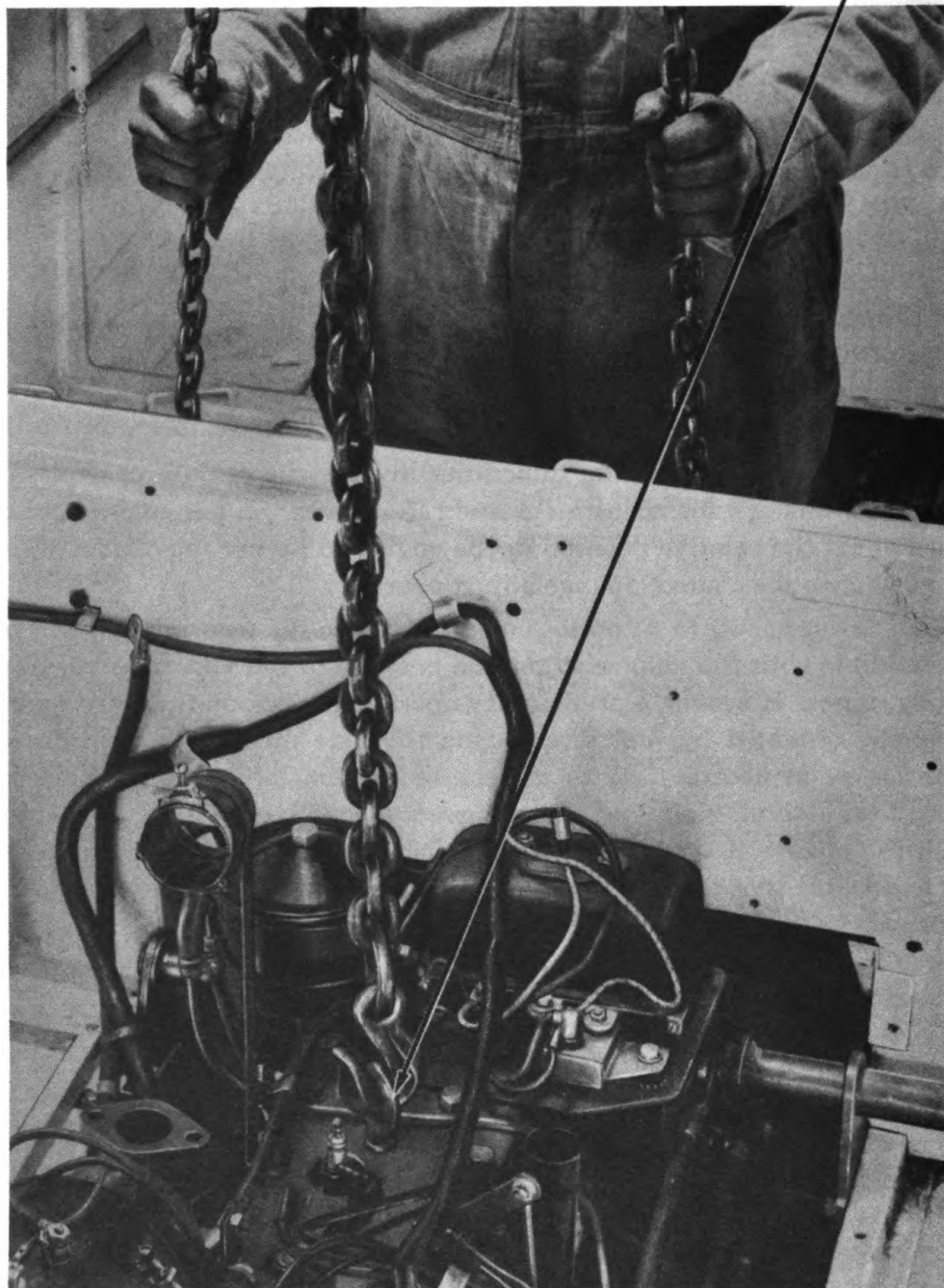
7. REMOVE TRANSMISSION.

a. Remove Top. Refer to paragraph 117.

b. Remove Engine Compartment Lid. Unscrew two large wing nuts holding engine compartment lid to side panel, and move lid up until

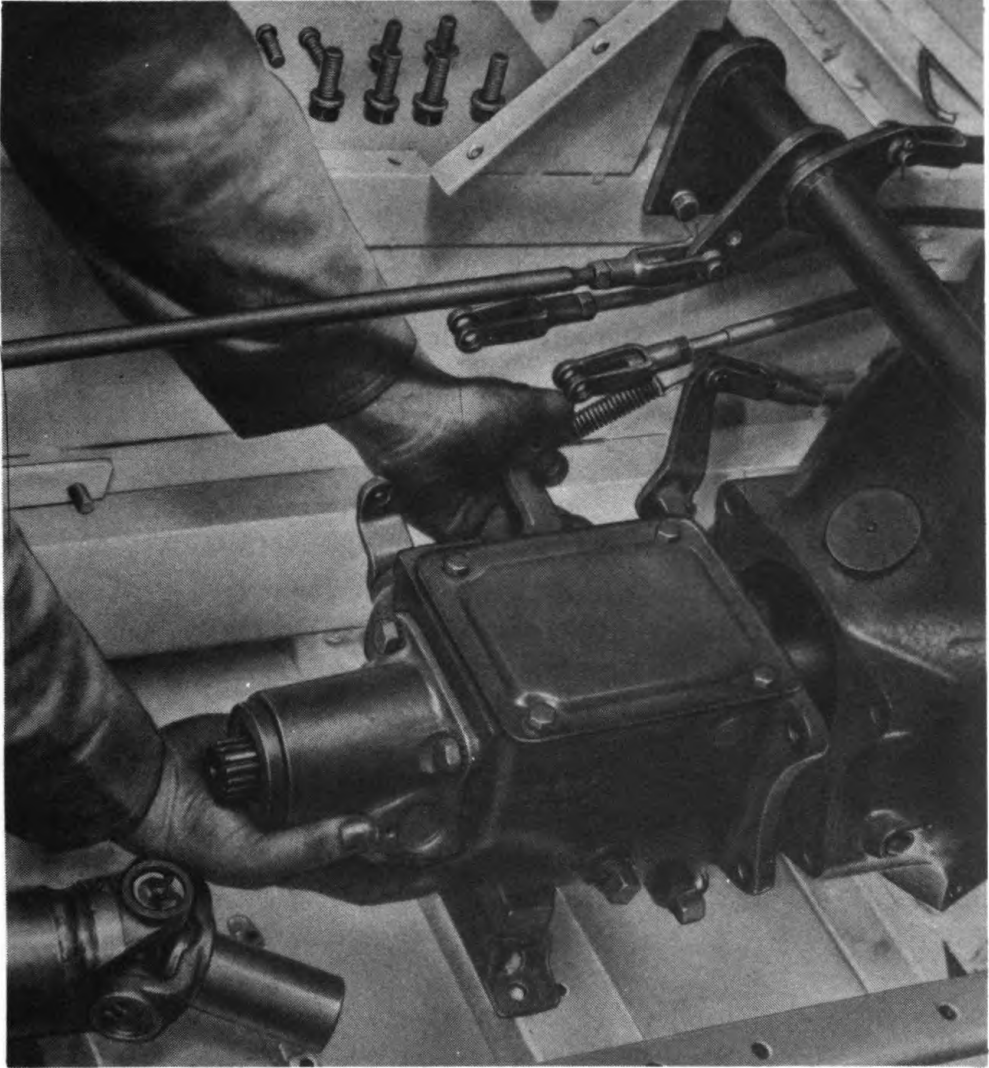
**ORDNANCE MAINTENANCE
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ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**

ENGINE LIFTING EYE BOLT KM-J3614



RA PD 67038

Figure 3—Supporting Rear of Engine

TRANSMISSION REMOVAL

RA PD 67047

Figure 4—Transmission Removal

engaging tongues can be removed from slots in hull coaming on right side. Lift lid from vehicle.

c. Remove Hull Floor Pan. Take out cap screws holding floor pan to hull, and remove pan.

d. Remove Propeller Shaft. Refer to paragraph 34.

e. Disconnect Transmission. Remove two screws securing engine rear (transmission) support mounting to the hull cross member. Disconnect remote control linkage at the transmission by removing cotter pins and clevis pins.

f. Support Rear of Engine. Remove hull drain plate and drain cooling system sufficiently to bring the solution level below top of cylinder

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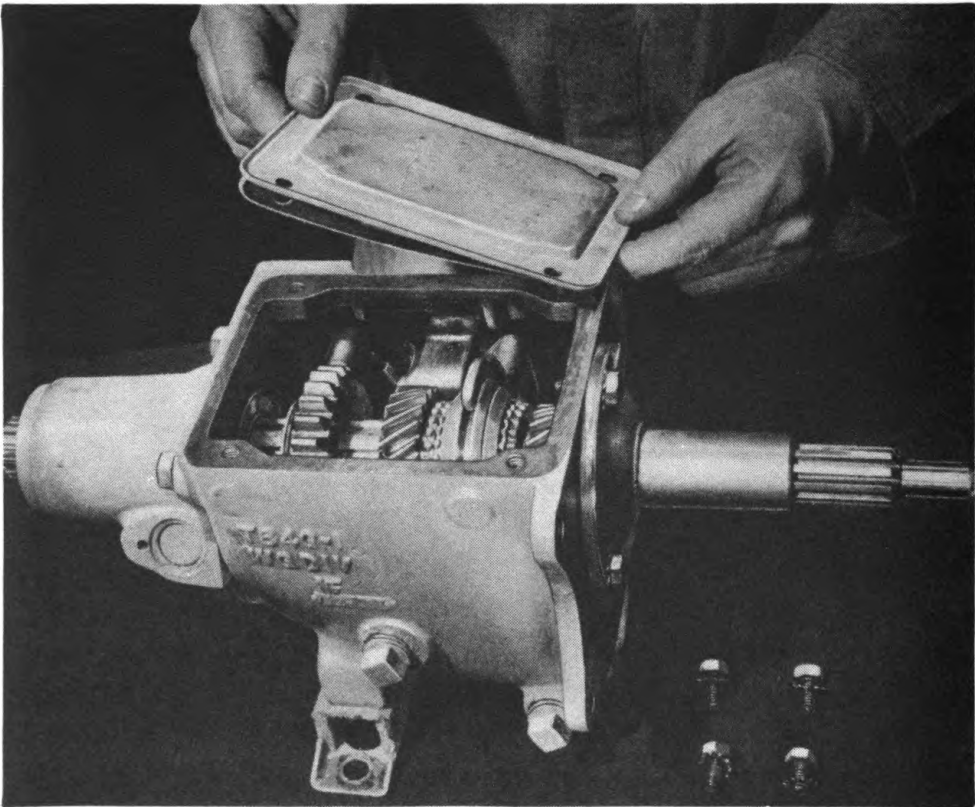
head. Remove cylinder head screw between two rear spark plugs, and install engine-lifting eyebolt KM-J-3614. Attach a hoist lifting chain to eyebolt and operate the hoist to raise and support the rear end of engine (fig. 3). (In an emergency, a block of wood may be used under the clutch housing to support the engine.)

g. **Remove Transmission.** Remove four cap screws and lock washers which secure transmission to clutch housing. While supporting transmission assembly with the hands, move the unit rearward until front end of transmission pinion has cleared clutch housing. Lift transmission out of the cockpit.

Section IV

TRANSMISSION CLEANING AND INSPECTION

	Paragraph
Cleaning	8
Inspection	9



RA PD 49414

Figure 5—Transmission Case Cover Removal

TRANSMISSION CLEANING AND INSPECTION

8. CLEANING.

a. Apply SOLVENT, dry-cleaning, with a brush or cloth to soak off any lubricant, dirt, or foreign matter that may have accumulated on the exterior of the case and flanges. Dry all surfaces with wiping cloths or by using compressed air.

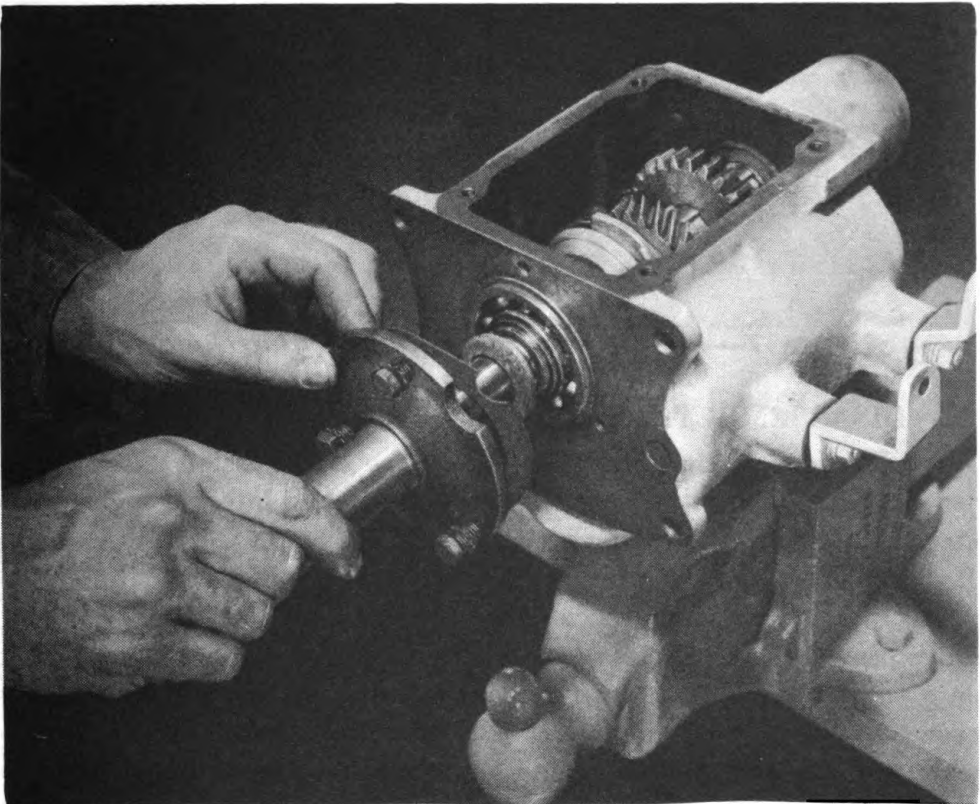
9. INSPECTION.

a. Remove the transmission case drain plug and drain out the lubricant. Carefully examine the outside of the transmission case, pinion flange, and mainshaft flange for cracks, oil seepage, or other external damage. Remove the four transmission case cover cap screws, internal lock washers, and lift the cover and gasket off the case (fig. 5). Inspect the internal transmission parts to detect any evidence of damaged gears, shafts, synchronizers, or shifting mechanism.

Section V

DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES

Disassembly	Paragraph 10
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RA PD 66966

Figure 6—Pinion Flange Removal

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RA PD 66969

Figure 7—Pinion Bearing Retainer Ring Removal

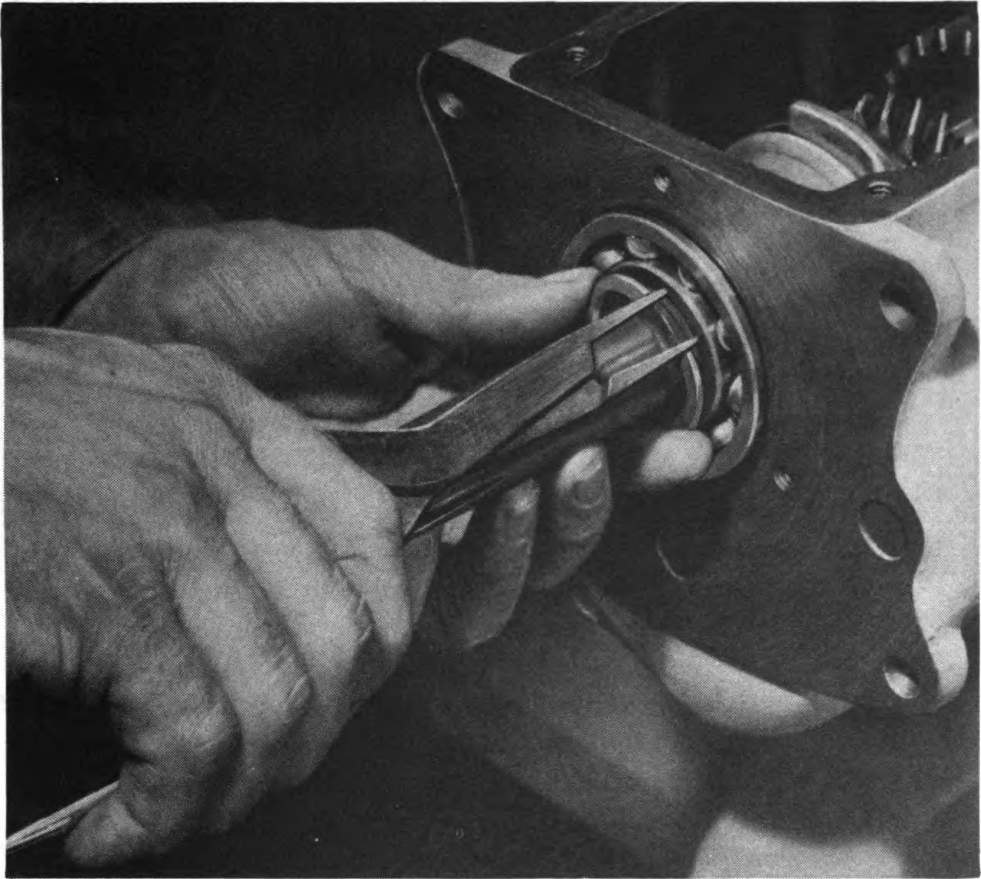
10. DISASSEMBLY.

a. **Remove Pinion Bearing.** Place the transmission assembly in a vise and remove the three pinion flange screws and internal lock washers. Slip pinion flange and gasket off pinion shaft (fig. 6). Slide the cork seal off pinion shaft. Remove pinion bearing large retainer ring (fig. 7). Remove pinion bearing small lock ring using snap ring pliers (fig. 8). Install puller plate KM-J3641 less adapter rings, so that pulling flanges on the plate enter retainer ring groove in pinion bearing. Tighten puller plate screws. Install utility puller KM-J3635 so that end of the puller screw bears against front end of pinion shaft. Install thrust yoke KM-J3643 with thinner side of yoke in groove in pinion gear. The thick side of the yoke will bear against the front face of the mainshaft second speed gear. (The thrust yoke must be used to prevent damaging the synchronizer

DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES

rings when pulling the pinion bearing.) Turn puller screw clockwise to pull pinion bearing out of case and off pinion shaft (fig. 9). Remove thrust yoke.

b. Remove Mainshaft Bearing. Take out four screws with internal lock washers that hold mainshaft flange to transmission case, and remove the flange and gasket. (The lowest screw is longer than the others.)



RA PD 49418

Figure 8—Pinion Bearing Lock Ring Removal

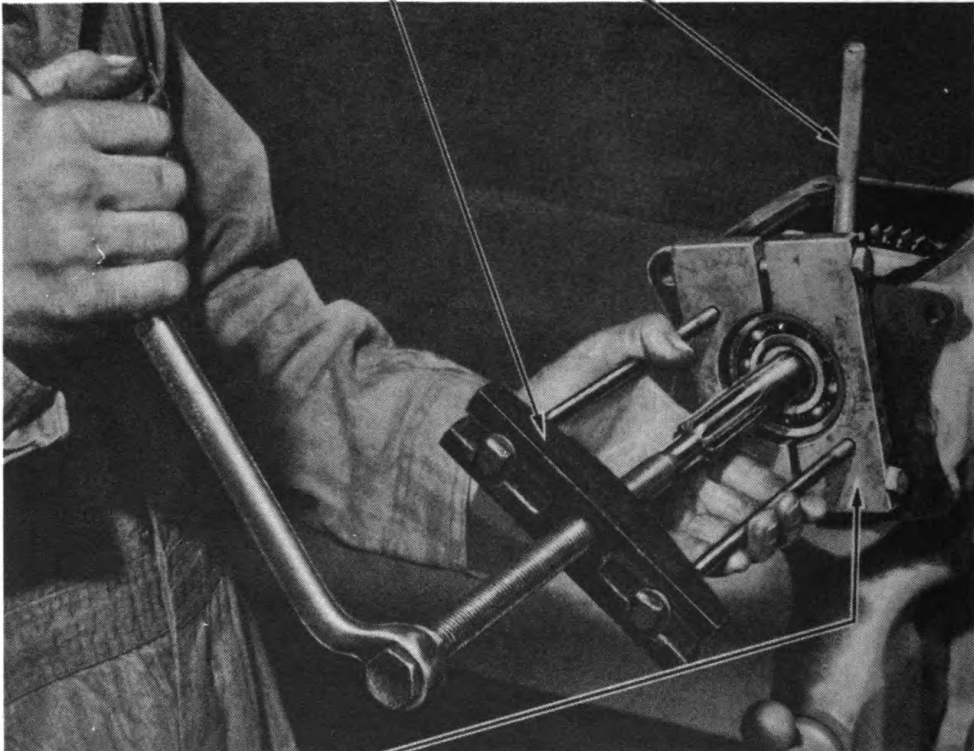
Remove spacer lock ring with snap ring pliers, slip spacer off mainshaft, and remove mainshaft rear bearing retainer ring. Place thrust yoke KM-J3643 in position as when pulling pinion bearing. Carefully pry in the bearing retainer ring groove to move mainshaft rear bearing out of case sufficiently to permit installation of bearing puller equipment (fig. 10). Install puller plate KM-J3641 with adapter rings so that pulling flanges on rings enter bearing ring groove, and tighten puller plate screws. Install utility puller KM-J3635 and pull bearing off mainshaft.

c. Remove Pinion and Mainshaft with Gears. Drive out from below the retaining pin at each shift lever shaft (fig. 11). Pull two shift lever shafts outward as far as possible. Move pinion and mainshaft with gears

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UNIVERSAL* PULLER KM-J3635

THRUST YOKE KM-J3643



REMOVER KM-J3641

RA PD 49417

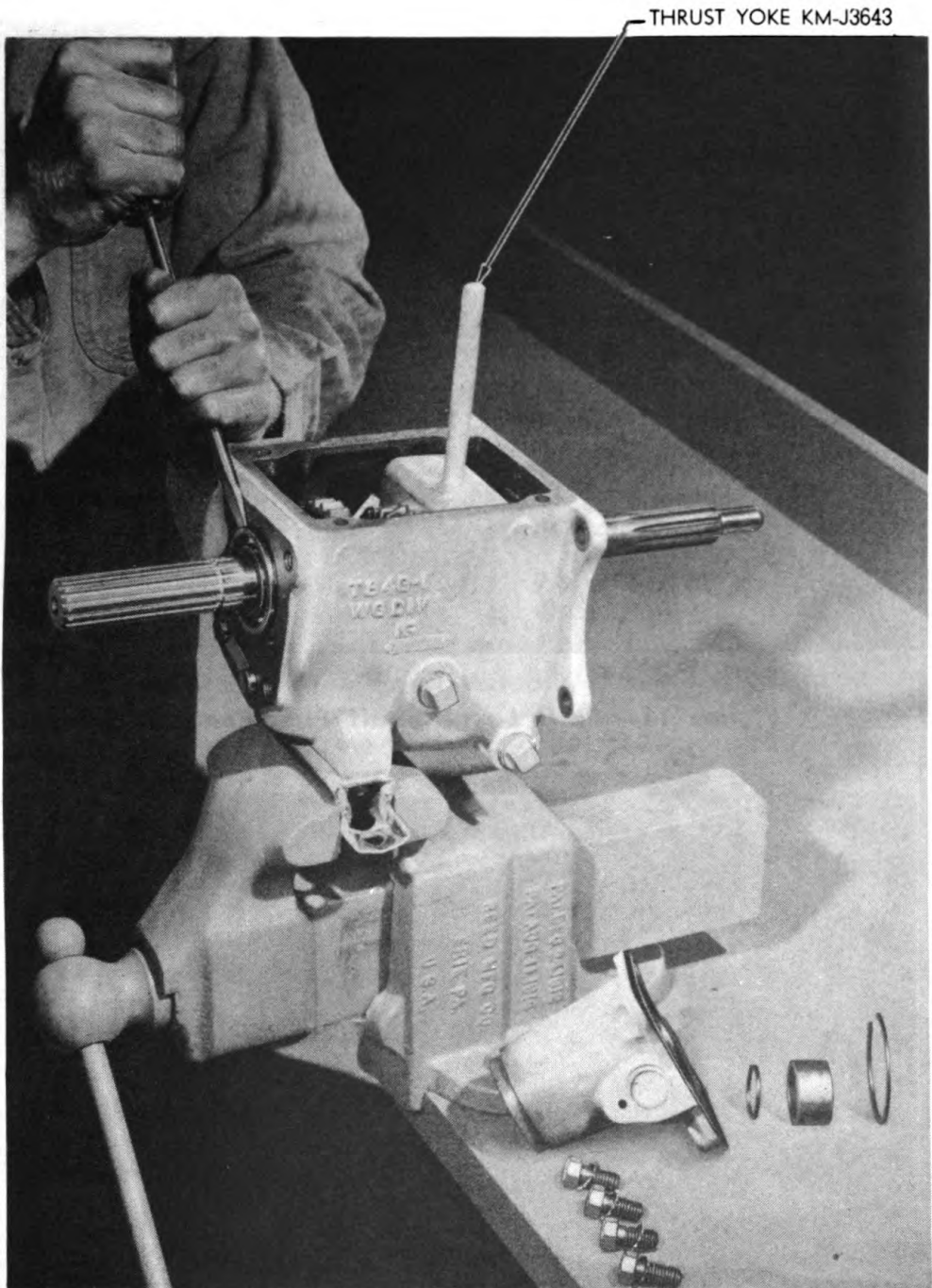
Figure 9—Method of Removing Pinion Bearing

away from shift fork and shoe, and move shift fork and shoe out of the way. Tilt the mainshaft slightly and pull pinion shaft away from end of mainshaft (fig. 12) and out from the front of the case (fig. 13). Lift mainshaft with gears and synchronizer upward and out through top of case (fig. 14). Remove shift fork and shoe from shift lever shafts.

d. Remove Countershaft and Gear Cluster. Remove countershaft and reverse idler gear shaft lock plate. Drive countershaft out rear of transmission case (fig. 15). Lift cluster gear out through the top of case. Note that the thrust washer at the front of the gear cluster (largest gear) has an ear which must be toward the case so that the washer will not turn with the cluster. Two thrust washers are used at the other end of the cluster. The washer with the small hole must be next to the case so small hole will fit over pin in case to hold it stationary. Between this rear thrust washer and the cluster is a thrust washer with ears that engage between teeth of small gear at rear so that it turns with the cluster.

e. Remove Reverse Idler Gear Shaft and Gear. Remove reverse idler gear shaft from transmission case, driving on the front end of the shaft if necessary. The reverse idler gear may be lifted out of the case as the shaft is removed. Note that gear hub extension is toward the front.

DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES



RA PD 49420

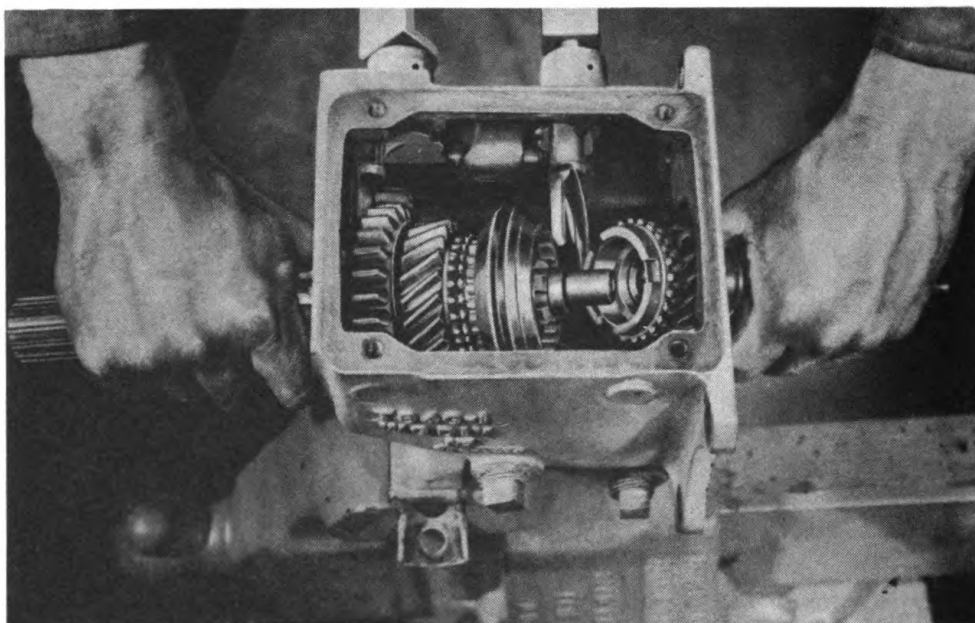
Figure 10—Mainshaft Rear Bearing Initial Removal

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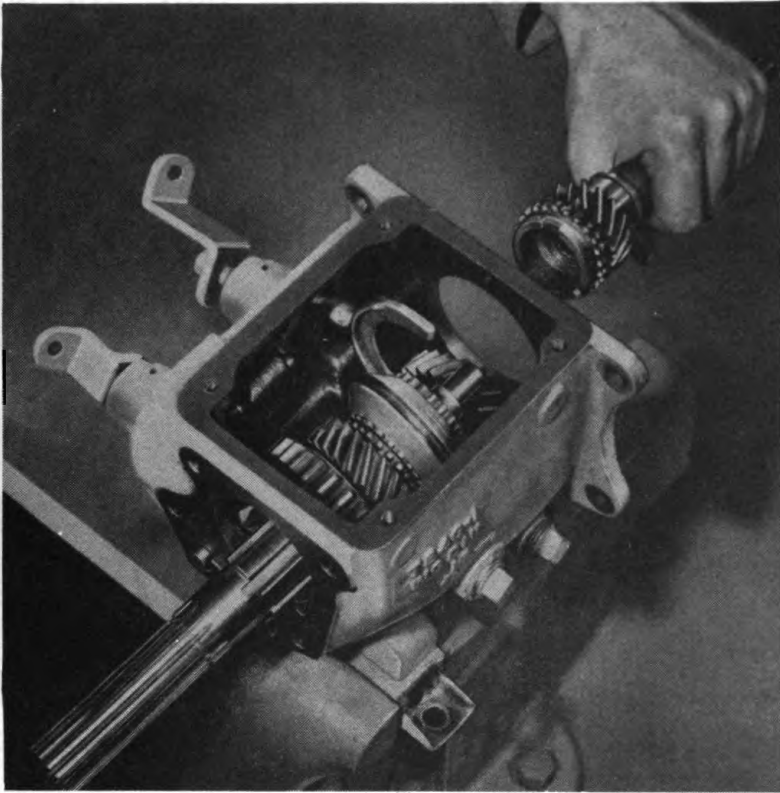
Figure 11—Shift Lever Shaft Pins Removal



RA PD 66978

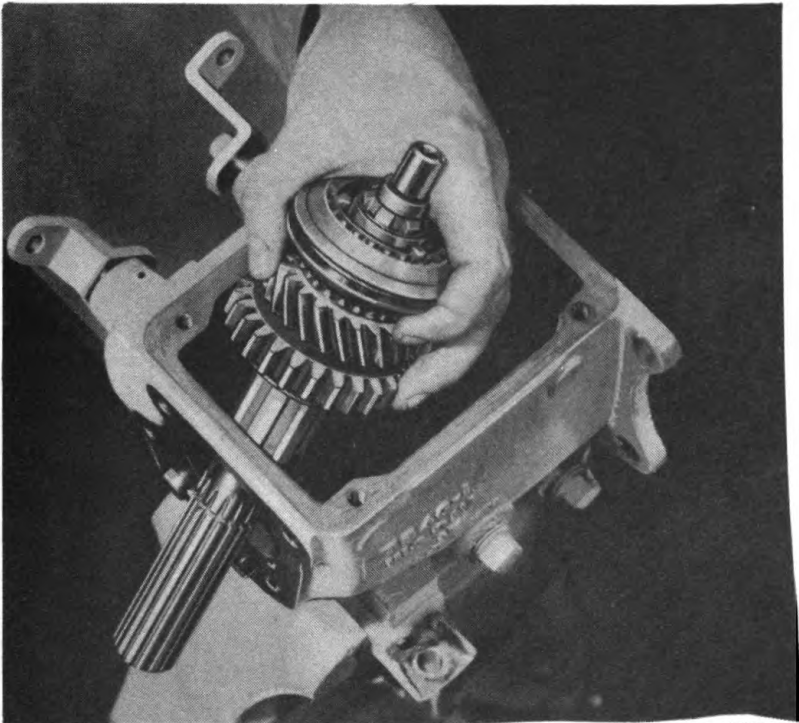
Figure 12—Separating Pinion and Mainshaft Assemblies

DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES



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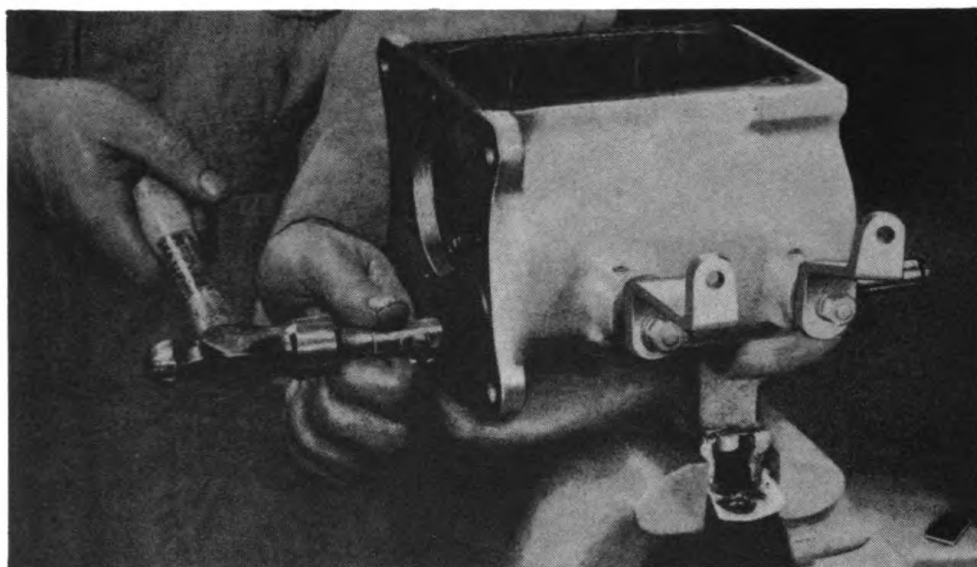
Figure 13—Pinion Assembly Removal



RA PD 66981

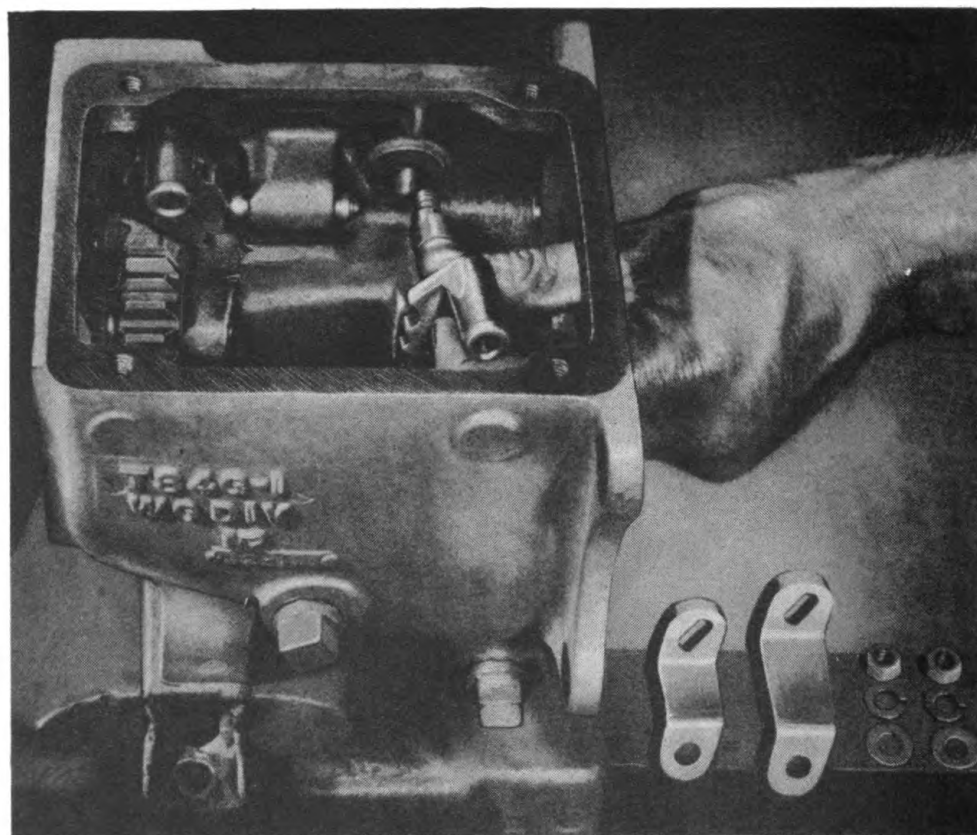
Figure 14—Mainshaft Assembly Removal

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RA PD 66986

Figure 15—Countershaft Removal



RA PD 66991

Figure 16—Shift Lever Shaft Removal

DISASSEMBLY OF TRANSMISSION INTO SUBASSEMBLIES

f. **Remove Shift Levers and Shafts.** Remove nut, lock washer, and flat washer that holds outer shift lever to shift shaft. Remove outer shift lever, cork seal, and lift shift lever shaft out of hole in the side of the case and out the top of the transmission case (fig. 16). Remove shift levers poppet from recess in side of case. Repeat the operations to remove the other shift lever and shaft.

g. **Remove Engine Rear Mounting from Transmission Case.** Remove the two cap screws and lock washers holding flexible engine front mounting with bracket to bottom of transmission.

Section VI

CLEANING OF TRANSMISSION PARTS

	Paragraph
Cleaning	11

11. CLEANING.

a. Clean all parts and subassemblies carefully in SOLVENT, dry-cleaning, and blow them dry with compressed air. Dislodge any solid particles that remain in the ball bearings by tapping them sharply on a block of wood. Immerse the bearings in cleaning solvent again and wash them to remove all traces of oil or dirt. Blow dry with compressed air, being careful not to direct the air at the side or face of the bearings to avoid spinning.

Section VII

TRANSMISSION COMPONENTS DISASSEMBLY, INSPECTION, REPAIR, AND ASSEMBLY

	Paragraph
General	12
Pinion and bearings	13
Mainshaft and parts	14
Countershaft and gear cluster	15
Reverse idler gear and shaft	16
Shifting mechanism	17
Engine rear mounting	18
Case and flanges	19

12. GENERAL.

a. The disassembly, cleaning, inspection, repair, and assembling of the various subassemblies must be performed with care and cleanliness. To

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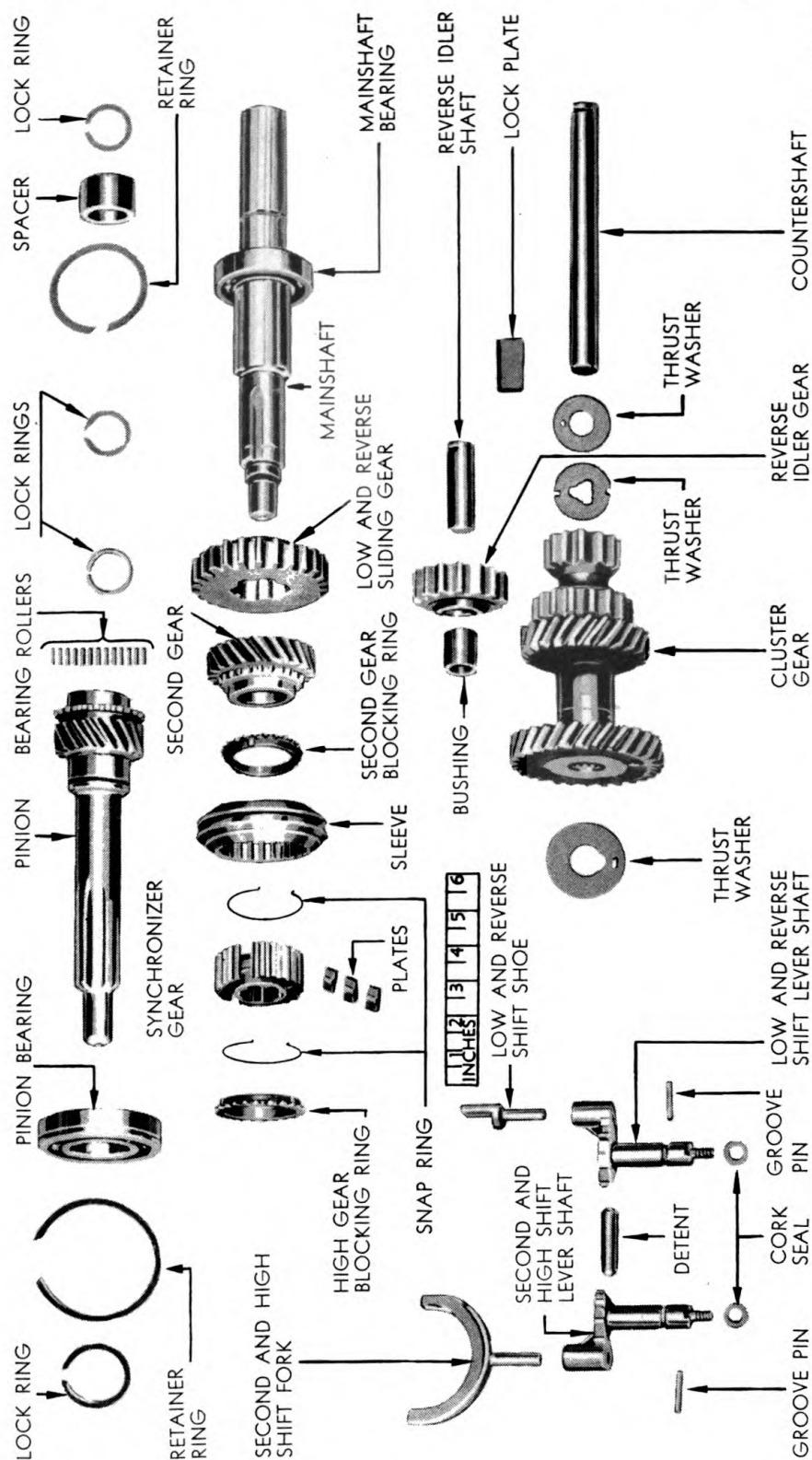


Figure 17—Transmission Gears, Shafts, Bearings, and Shifter Details

RA PD 66891

**TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**



RA PD 49425

Figure 18—Pinion Bearing Rollers Lock Ring Removal

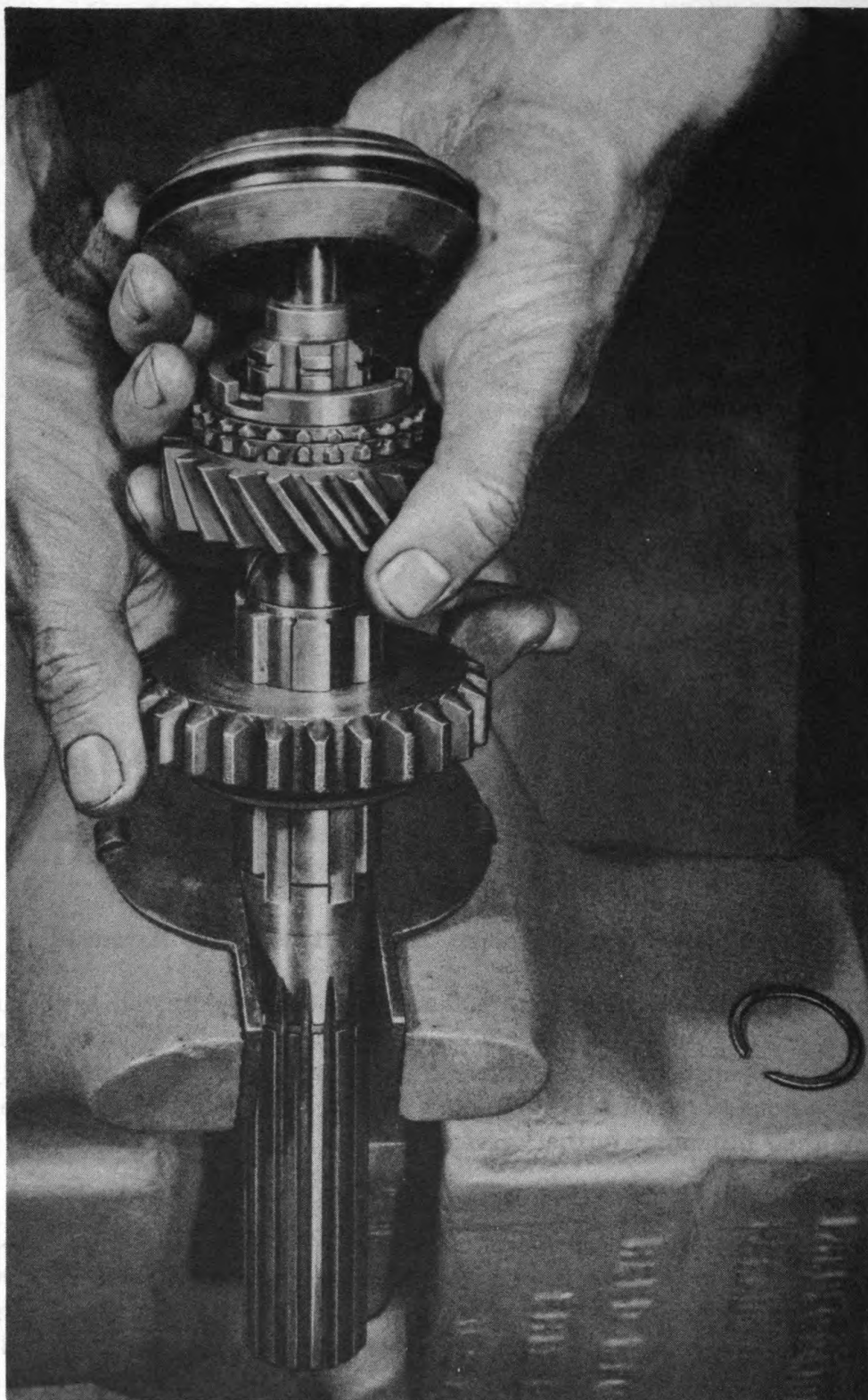
avoid confusion or error, each subassembly must be treated as a unit. Mark certain related parts before disassembly, to aid in subsequent assembly operations. Carefully clean each component after disassembly. The various parts must be inspected carefully and thoroughly to determine their fitness for further service.

13. PINION AND BEARINGS.

a. **Disassembly.** Lift synchronizer ring off gear end of pinion. Hold pinion assembly in a vise having copper or other soft metal inserts for the jaws. Remove bearing roller lock ring from groove in pinion recess, using a thin narrow blade screwdriver and a 4-inch blade screwdriver (fig. 18). Remove the 13 bearing rollers.

b. **Inspection and Repair.** Clean all parts in SOLVENT, dry-cleaning. Inspect ball bearing and bearing rollers for galling or damage. In-

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RA PD 49439

**Figure 19—Synchronizer, Second Speed Gear, and
Low and Reverse Sliding Gear Removal**

TRANSMISSION COMPONENTS DISASSEMBLY, INSPECTION, REPAIR, AND ASSEMBLY

spect pinion helical gear teeth for evidence of damage. Examine splines on pinion shaft for damage. Inspect high speed gear teeth for chipping. If extensive damage is evident to gear teeth or shaft splines, a new pinion must be installed unless any burs or damage can be eliminated by stoning. Replace ball bearing and bearing rollers if damaged.

c. **Assembly.** With pinion held in a vise having copper or other soft metal inserts for the jaws, place the 13 bearing rollers around the wall of the recess in the pinion, using grease to hold the rollers in their proper position. Install bearing rollers retainer ring in its groove in pinion recess, using a thin narrow blade screwdriver. Place synchronizer ring in position over inner end of pinion with teeth next to high gear teeth on pinion. (If the high gear and second speed gear synchronizer rings are placed in a cleaning tank together, it is important that each ring be marked in some way to assure its installation at the same location as before disassembly.)

14. MAINSHAFT AND PARTS.

a. **Disassembly.** Fasten mainshaft with gears and synchronizer in a vise having copper or other soft metal inserts for the jaws. Remove lock ring from front end of mainshaft, using snap ring pliers. Slide synchronizer gear and sleeve assembly off end of mainshaft. Note that the synchronizer sleeve side having a circular marking groove is installed toward the front (pinion) end of the mainshaft. Slip second speed gear synchronizer ring off end of mainshaft. Slide second speed gear and low and reverse sliding gear off end of mainshaft (fig. 19). Note that the short hub of the second speed gear is installed next to the low and reverse sliding gear, and the flat face of the low and reverse sliding gear is toward the second speed gear. Slip synchronizer sleeve off synchronizer gear. The three synchronizer shoe plates will fall off the gear as will the snap rings on the sides of the gear (fig. 20).

b. **Inspection and Repair.** Clean all parts in SOLVENT, dry-cleaning, and wipe them thoroughly. Examine teeth on gears for chipping or damage. Inspect bushing in the second speed gear. If damaged, a new gear with bushing must be installed. Inspect mainshaft and ball bearing for scores or damage. If necessary, dress with a fine stone any rough portions on the gears or shaft. Replace with new parts any damaged items which are available separately, or install a new mainshaft with gears assembly.

c. **Assembly.** Apply SAE No. 10 engine oil to the parts before or while assembling components to the mainshaft. Install the shoe plate snap rings in synchronizer gear, and install three shoe plates in position on the gear. While holding shoe plates in place with one hand, slip synchronizer sleeve over gear and shoes. Make certain that sleeve is installed

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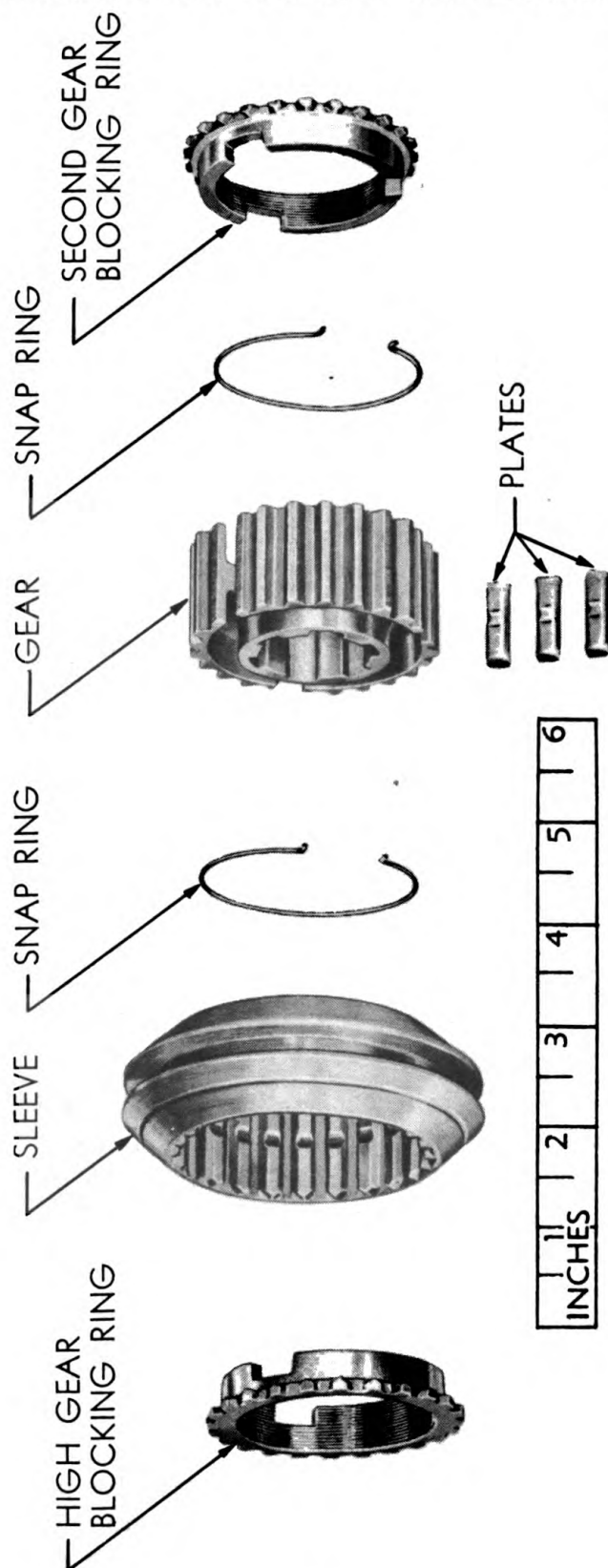


Figure 20—Synchronizer Parts

**TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**



RA PD 49426

Figure 21—Synchronizer Hub Lock Ring Installation

so the circular marking groove is on the same side of the gear which has hub practically flush with end of the gear teeth. Fasten the mainshaft in a vise having copper or other soft metal inserts for the jaws. Slip first and reverse sliding gear over large splines on mainshaft, noting that the side of the gear having the shift shoe goes on first. Slide second speed gear over end of mainshaft, noting that side with the small teeth goes on last. Install second speed gear synchronizer ring with its teeth nearest the second speed gear small spur teeth. Install synchronizer assembly. (The circular marking groove in the side of the sleeve must be toward the pinion.) Using snap ring pliers, install lock ring in groove near front end of mainshaft (fig. 21).

15. COUNTERSHAFT AND GEAR CLUSTER.

a. Disassembly. Remove bushing from each end of gear cluster bore and spacer between bushings. (These parts are a slip fit in the cluster bore.)

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IDLER GEAR BUSHING REMOVER AND REPLACER KM-J3806



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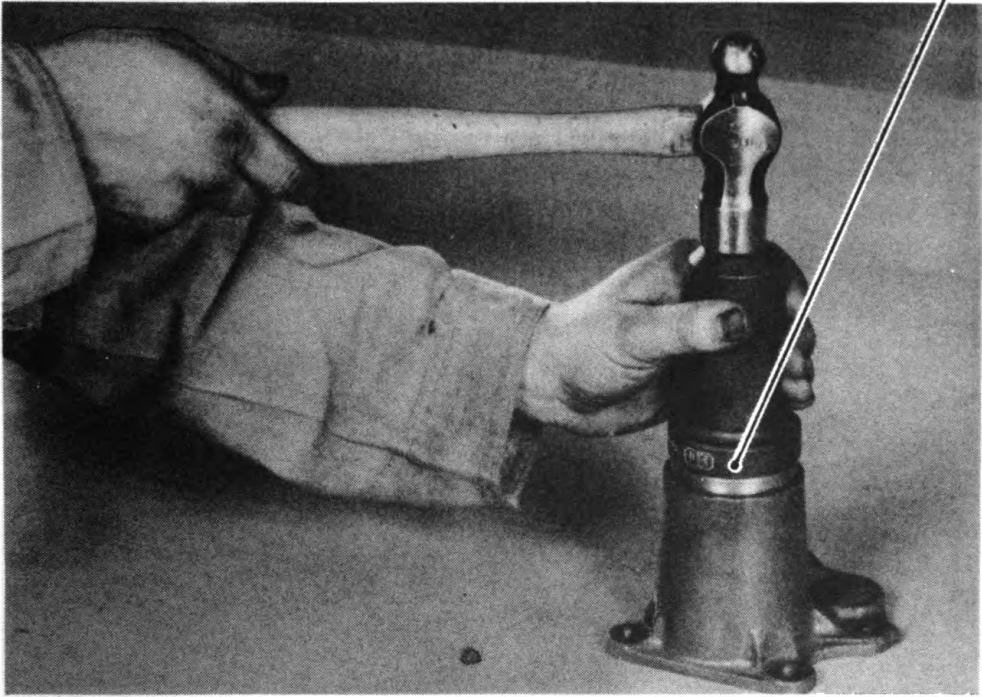
Figure 22—Method of Removing Reverse Idler Gear Bushing

b. **Inspection and Repair.** Clean parts with SOLVENT, dry-cleaning. Wipe parts with a clean cloth and examine teeth on gears for chipping or other damage. Remove any burrs or nicks by stoning. Inspect bushings and countershaft; if they are damaged, new parts must be installed.

c. **Assembly.** Install two bushings with spacer between them in bore of gear cluster.

**TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**

TRANSMISSION REAR FLANGE OIL
SEAL REPLACER KM-J3804



RA PD 67136

Figure 23—Installing Mainshaft Flange Oil Seal

16. REVERSE IDLER GEAR AND SHAFT.

a. **Inspection and Repair.** Clean the parts in SOLVENT, dry-cleaning. Determine by inspection whether the gear teeth, bushing, and shaft are damaged. If the gear, bushing, or shaft is damaged, new parts must be installed. To replace the bushing, drive or press the bushing out of the reverse idler gear bore, using bushing remover and replacer KM-J3806 (fig. 22). Install a new bushing in the hub of the reverse idler gear, using the same tools. Make sure the gear turns freely on the shaft.

17. SHIFTING MECHANISM.

a. **Inspection and Repair.** Clean the parts in SOLVENT, dry-cleaning, and dry with a clean cloth. Inspect inner levers and shafts, fork, and shoe for damage. Any parts found to be damaged and unfit for further service must be replaced.

18. ENGINE REAR MOUNTING.

a. **Inspection and Repair.** Clean the metal portion of this part with a putty knife and wiping cloth. Inspect the metal portion of the mounting for cracks. Check the rubber cushion to determine if it has deteriorated or is oil-soaked. If the mounting is unfit for service, replace it.

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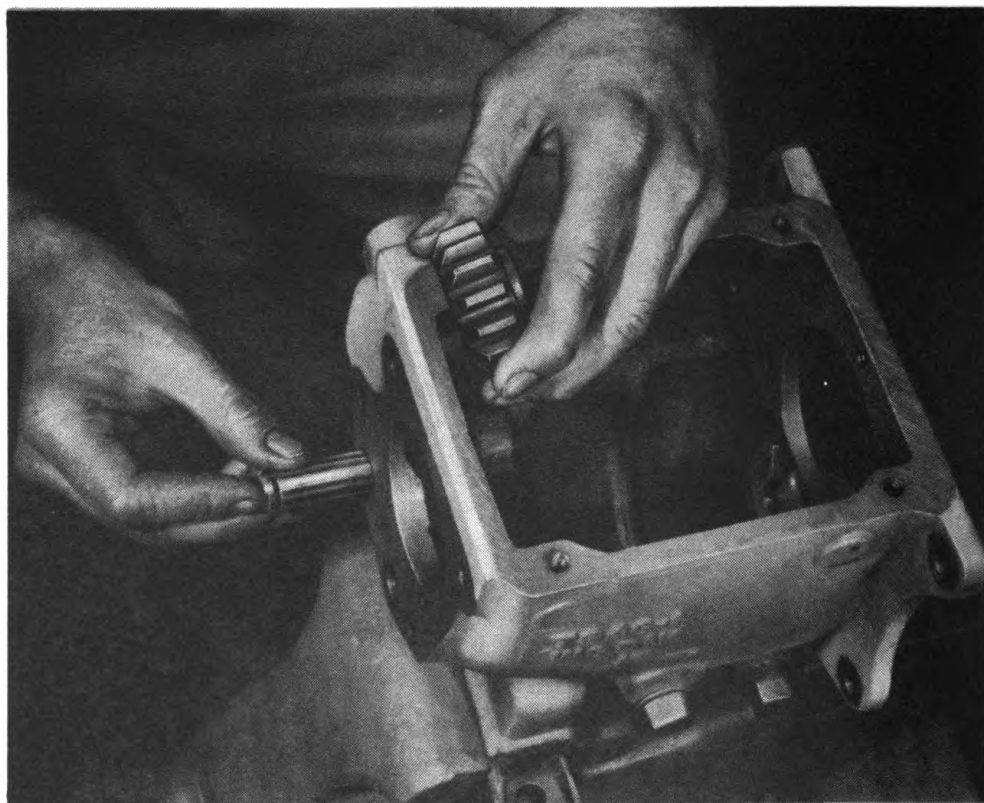
19. CASE AND FLANGES.

a. **Inspection and Repair.** Inspect inside of the case for damage. Examine case front flange (pinion end) for damage, and extension for grooves. Check case front flange for damage and make sure that oil seal contacts transmission slip joint outer machined surface. If any of the parts are damaged, replace them. Install a new oil seal by driving it into place with KM-J3804 seal replacer (fig. 23).

Section VIII

ASSEMBLY OF TRANSMISSION SUBASSEMBLIES

	Paragraph
Assembly	20



RA PD 49440

Figure 24—Reverse Idler Gear and Shaft Installation

20. ASSEMBLY.

a. **Install Engine Rear Mounting on Transmission Case.** Install engine rear mounting to the transmission case. Tighten two cap screws and lock washers.

ASSEMBLY OF TRANSMISSION SUBASSEMBLIES



RA PD 49428

Figure 25—Method of Installing Countershaft Gear Cluster and Shaft

b. Install Shift Levers and Shafts. Place the transmission case in a vise and install rear (low and reverse) shift lever and shaft from top of transmission, noting that poppet cam must be toward the poppet recess, and shift shoe shaft bore toward the top. Install a new cork seal over the end of shift shaft. Place outer shift lever (short) on end of shaft, flat washer, lock washer, and nut and tighten nut securely. Install poppet in recess within case. Repeat the installation procedure to install the second and high shift lever and shaft with related parts. Make sure outer shift lever (long) is installed with clevis pin eye toward top, and bend in lever away from case.

c. Install Reverse Idler Gear and Shaft. Place gear in case with gear hub extension toward front (fig. 24). Slip shaft into case and through gear until lock groove in shaft remains slightly out of case.

d. Install Countershaft Gear Cluster and Shaft. Install rear thrust washer so that small hole in washer fits over pin in case. Use grease to hold washer in position. Install other front thrust washer at small gear end of the cluster so that ears fit between gear teeth. Install front thrust

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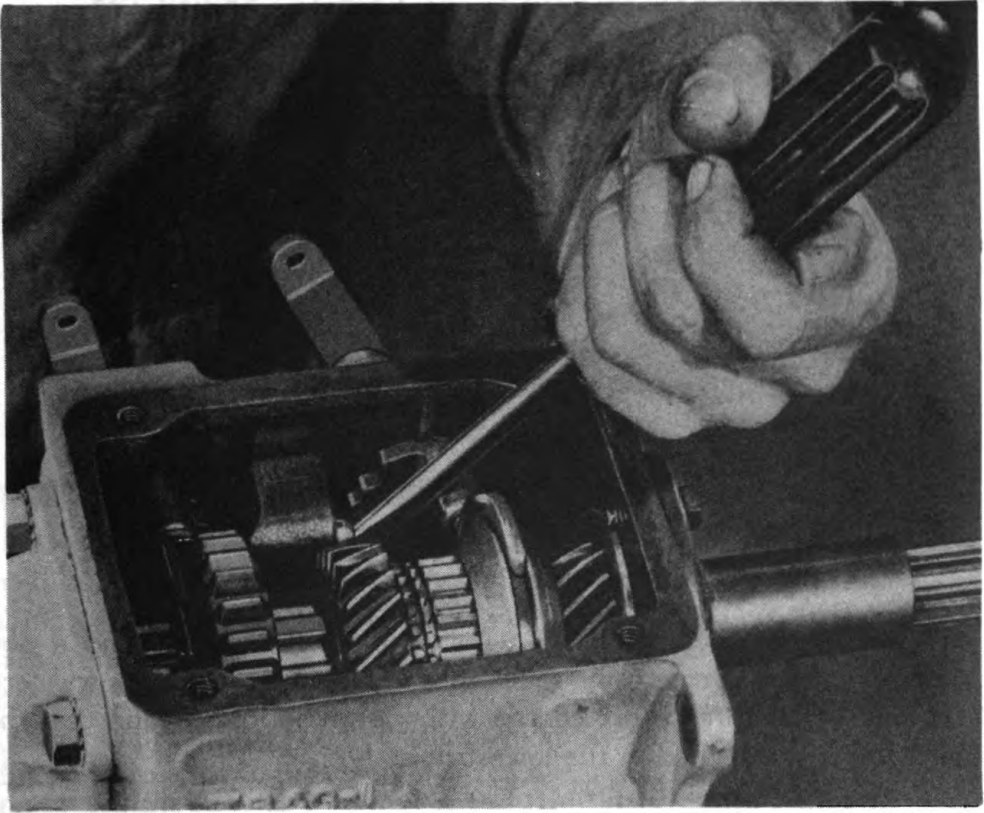
RA PD 66982

Figure 26—Pinion and Mainshaft Assemblies Installation

washer against case, using grease to hold washer with its ear next to case. Carefully lower gear cluster into position (largest gear toward the rear) so that shaft bores in case are in line with cluster bore. Use a dummy shaft at the front end to maintain the cluster in position while inserting the countershaft into the case and cluster bores from the rear (fig. 25). Tap countershaft in until shaft lock groove remains slightly out of case. Install countershaft and reverse idler gear shaft lock plate, then tap locked ends of shafts to make sure shafts are located properly and lock plate is secure.

e. Install Mainshaft with Gears and Pinion. Insert shift fork and shoe in their respective shift levers and move fork and shoe as close as

ASSEMBLY OF TRANSMISSION SUBASSEMBLIES



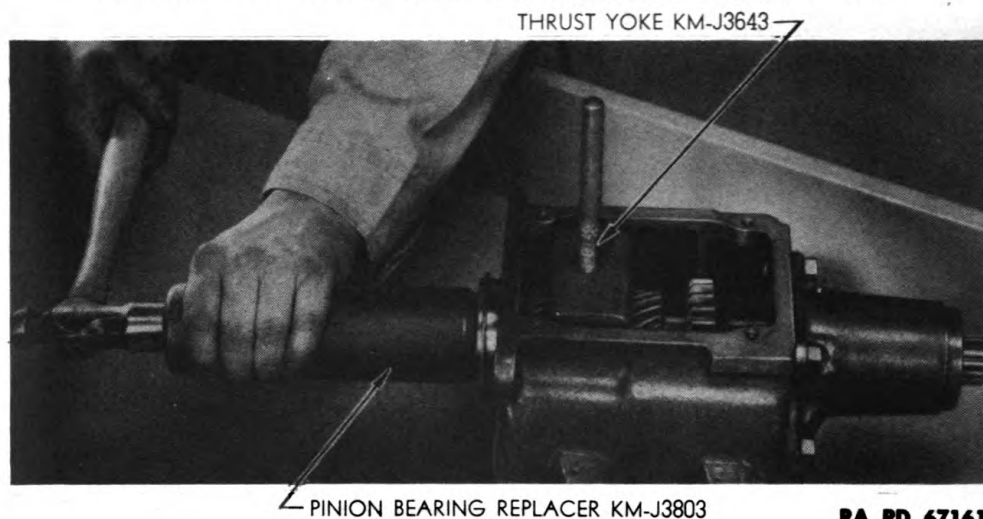
RA PD 66967

Figure 27—Method of Engaging Poppet

possible to ends of case. Install mainshaft with gears and synchronizer by lowering end with small splines down through opening in top of case and out bore in rear (fig. 26). Place SAE No. 10 engine oil on the front end of mainshaft where it revolves on the bearing rollers recessed in the pinion. Place pinion assembly into front opening of case and over front end of mainshaft. Roll two connected shafts with gears against side of the case opposite shifting parts, and aline shift fork and shoe with their operating grooves. Move shaft and pinion toward center so that shifting fork and shoe engage in their respective operating grooves.

f. **Install Mainshaft Bearing.** Coat bearing with SAE No. 10 engine oil. Install the bearing over end of shaft with lock ring groove toward outside of case. Install thrust yoke J-3643 with thin side of yoke in the pinion gear groove. Use a section of tubing or pipe (1¼-inch inside diameter) and a copper or soft metal hammer to drive the tube against bearing inner race when installing bearing into its proper location. Hold pinion with one hand in order to provide thrust while driving mainshaft bearing into place. Install large retainer ring. Tap the tubing with soft metal hammer to make sure bearing retainer ring is against the transmission case. Slip spacer over end of shaft and install small lock ring, using snap ring pliers.

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RA PD 67161

Figure 28—Pinion Bearing Installation

g. Install Mainshaft Flange. Install mainshaft flange and a new gasket on rear end of case using four cap screws and internal lock washers. Make sure screw threads are coated with white lead paste, and that the longest screw is installed in the lowest hole.

h. Engage Poppet with Shift Lever Cams. Push one shift lever and shaft so middle notch on cam engages with ball at one end of poppet. Then depress the other poppet ball at the free end of poppet and move the other shift lever and shaft, so the middle notch on cam engages poppet ball (fig. 27). Install the lever shaft retaining pins.

i. Install Pinion Bearing. With thrust yoke, KM-J3643, in position, install pinion bearing over end of the pinion shaft, with ring groove in bearing toward the outside. Drive bearing into place in the end of the case, using replacer KM-J3803 (fig. 28). Install pinion bearing small lock ring, using snap ring pliers. Install pinion bearing large retainer ring. Remove thrust yoke. Install a new cork seal over end of pinion shaft so it is against the bearing. Install a new gasket and pinion flange. Install three cap screws and internal lock washers, using white lead paste on the screw threads.

Section IX

TEST TRANSMISSION

	Paragraph
Test	21

21. TEST.

a. Test the transmission for free rotation and proper operation of the shifting mechanism by turning the pinion shaft with the hand, and shifting

TEST TRANSMISSION

into the different gear positions by moving the external levers. Place one pint of SAE No. 10 engine oil in the case before the cover is installed. Install the case cover with the four screws and internal lock washers. Install a dummy transmission slip joint, or pack rags between the main-shaft and oil seal to prevent loss of lubricant when the transmission is installed.

Section X

INSTALLATION AND TEST OF TRANSMISSION

	Paragraph
Install and test transmission	22

22. INSTALL AND TEST TRANSMISSION.

a. Install and Secure Transmission to Clutch Housing. Before installing the transmission assembly, operate the low and reverse outer shift lever to engage the low and reverse sliding gear. Lift the transmission assembly with the hands, and carefully insert the end of the pinion through the clutch housing bore and clutch release bearing. As the pinion splines approach the clutch driven member splines, rotate transmission dummy slip joint to the right or left to mesh the splines. Continue moving the assembly forward until the front end of the pinion enters the clutch pilot bushing and the transmission case is against the clutch housing rearward face. Install the four cap screws with lock washers and tighten them securely.

b. Connect Transmission. With the shim in place between the support mounting and the pad on the floor of the hull, install the two screws. Lower the engine and tighten the support mounting screws securely. Connect remote control linkage to outer shift levers with clevis pins and new cotter pins. Apply SAE No. 10 engine oil to the linkage.

c. Remove Support from Rear of Engine. Remove hoist lifting chain and eyebolt. Coat the threads of the cylinder head screw with white lead paste, and tighten properly (600 to 650 inch-pounds) with tension wrench. Reinstall the cooling system solution and check for leakage. Coat the hull drain plate screws, the hull drain plate, and the new gasket with joint and thread compound. Install the plate and gasket and tighten the screws securely.

d. Install Propeller Shaft. Refer to paragraph 40.

e. Install Hull Floor Pan. Place pan in position and install holding cap screws.

f. Install Top. Place top bows in position in sockets, cotter key and tighten wing nuts on windshield frame.

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g. **Test.** Start the engine and shift remote control shift levers into various speed positions to determine if the gears in the transmission are engaging properly. If the gears do not engage fully, adjust the remote control linkage as outlined in paragraph 29.

Section XI

TRANSMISSION CONTROLS AND LINKAGE

	Paragraph
Description	23
Removal of controls and linkage	24
Disassembly of transmission remote control shift lever shafts and related parts	25
Inspection and repair of transmission remote control shift lever, shafts and related parts	26
Assembly of transmission remote control shift lever, shafts and related parts	27
Installation of controls and linkage	28
Installation of remote control shift rods	29

23. DESCRIPTION.

a. The function of the transmission controls is to provide a means of shifting the transmission into the different gear positions. This is accomplished by a remote control system, consisting of a shifter lever, cross shaft, rod assemblies and transmission external levers (fig. 29).

24. REMOVAL OF CONTROLS AND LINKAGE.

a. **Remove Engine Compartment Lid.** Loosen wing nuts, lift lid to disengage tongues from slots in coaming, and remove lid.

b. **Disconnect and Remove Instrument Panel.** Disconnect ground cable from battery terminal. Disconnect inlet and outlet pipe coupling nuts at the primer. Remove primer knob from connection on instrument panel. Remove screws holding instrument panel, move it inward and place it on the engine when removing compartment side panel.

c. **Remove Engine Compartment Side Panel.** Remove spotlight and compass light wire socket connections from the panel. Remove cap screws holding rear cross shaft cover in position. Remove cap screws holding engine compartment side panel in position. Remove wire harness from attaching clips on back of the panel. Remove compartment side panel.

TRANSMISSION CONTROLS AND LINKAGE

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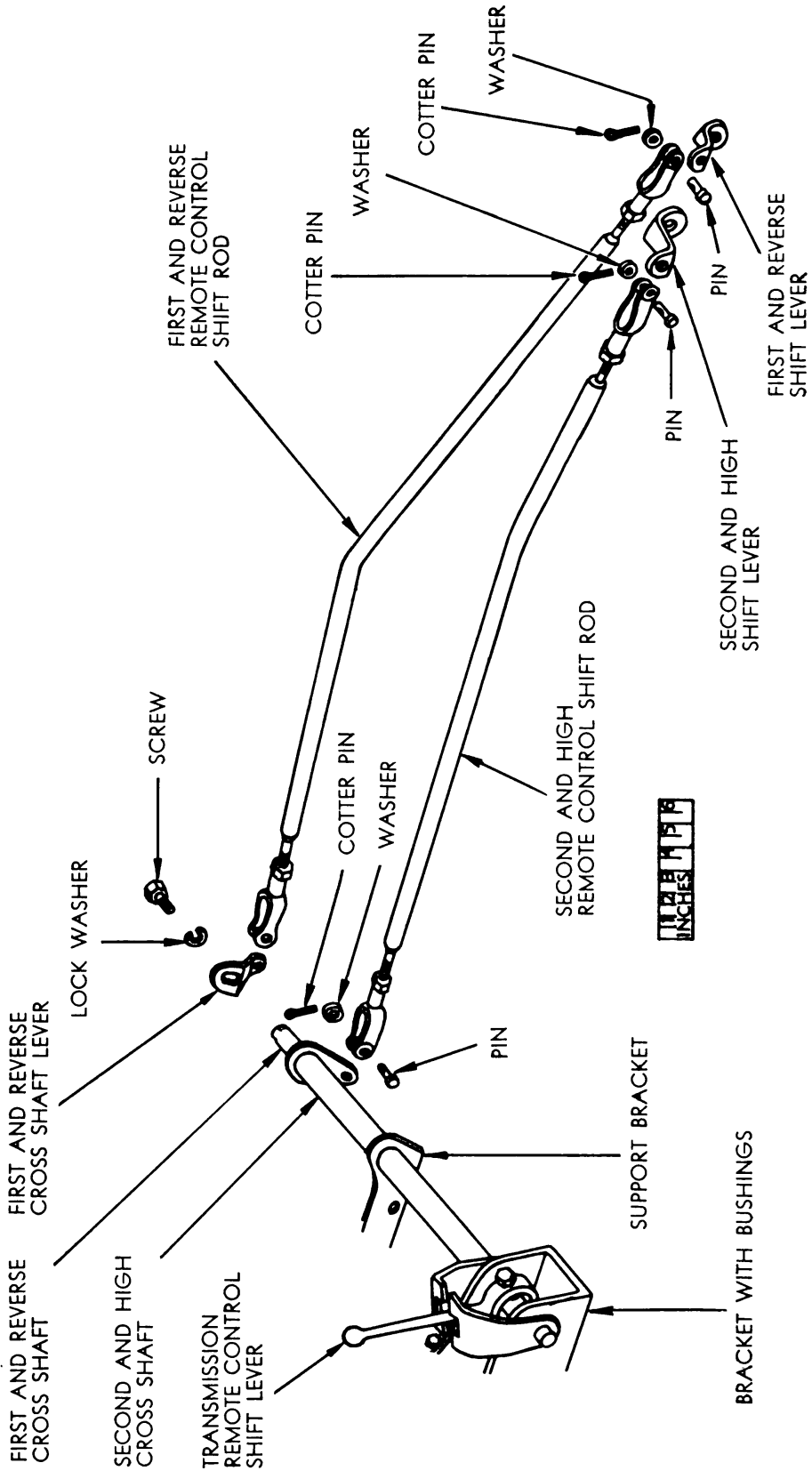


Figure 29—Transmission Shift Linkage

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d. **Remove Hull Floor Pan.** Remove cap screws holding the hull floor pan in position and lift pan out of vehicle.

e. **Remove Remote Control Shift Rods.** Disconnect shift rods at both ends by removing cotter pins and clevis pins. Lift rods from vehicle for inspection, repair, or replacement.

f. **Remove Steering and Shifter Lever Assemblies.** Disconnect outer ends of steering lever shafts, the transmission shift lever shaft, and the axle transmission shaft forward end, by removing cotter pins and clevis pins. Remove cap screws from hull floor bracket which supports transmission shift lever shafts and axle transmission shift lever shaft. Remove cap screws in shift lever shaft supporting bracket on right side of driver's compartment. Remove the entire assembly from the vehicle for disassembly, inspection, repair, or replacement.

25. DISASSEMBLY OF TRANSMISSION REMOTE CONTROL SHIFT LEVER SHAFTS AND RELATED PARTS.

a. The low and reverse transmission remote control shaft with fork will be referred to as the solid shaft. The second and high transmission remote control shaft with fork will be referred to as the tubular shaft.

b. Remove the cap screw and lock washer from right outer end of the solid shaft. Remove operating arm from shaft.

c. Remove operating arm from right outer end of axle transmission shift shaft.

d. Loosen bolt attaching transmission shift lever to solid shaft, and slide shaft out of tubular shaft and hull floor bracket.

26. INSPECTION AND REPAIR OF TRANSMISSION REMOTE CONTROL SHIFT LEVER, SHAFTS AND RELATED PARTS.

a. Clean all parts with SOLVENT, dry-cleaning, and dry with clean cloth.

b. Inspect shifting forks for cracks or distortion. Repair or replace as necessary.

c. Inspect shifting forks at point of welding to shafts for looseness or cracks at weld. Repair or replace as necessary.

d. Inspect shafts for scores or other damage. Repair or replace as necessary.

e. Inspect bushing in shift lever for scores or other damage. Repair or replace as necessary.

f. Examine shift rods. If shift rods have been bent from their original shape, they must be re-formed or replaced.

TRANSMISSION CONTROLS AND LINKAGE

27. ASSEMBLY OF TRANSMISSION REMOTE CONTROL SHIFT LEVER, SHAFTS, AND RELATED PARTS.

a. While the entire assembly is on the work bench, insert left end of tubular shaft into right side of hull floor bracket. Holding solid shaft in one hand and transmission shift lever in the other, start shaft through left side of hull floor bracket. Place transmission shift lever over end of shaft with screw head to rear, and push solid shaft through tubular shaft. Install axle transmission operating arm on right end of axle transmission shift shaft. Assemble low and reverse operating arm on right end of solid shaft. Install lock washer and cap screw and tighten securely.

28. INSTALLATION OF CONTROLS AND LINKAGE.

a. **Install Steering and Shift Lever Assemblies.** Place the assembly in hull floor and fasten bracket to hull floor securely. Fasten transmission shift lever shaft and axle transmission lever shaft supporting bracket securely to hull. Connect outer ends of steering lever shafts, the transmission shift lever shafts and the axle transmission shaft by installing the clevis pins and new cotter pins.

29. INSTALLATION OF REMOTE CONTROL SHIFT RODS.

a. **Install Remote Control Shift Rods.** Place shift rods in position; the longer rod operating the low and reverse shift lever goes to the rear external lever on the transmission. Install shift rod clevis pin and new cotter pin. At the front, connect both shift rods to control levers with clevis pins and new cotter pins. With remote control shift lever and transmission in neutral, readjust both clevises at rear end of the rods if necessary so that the holes in each clevis are alined with the holes in the transmission external shift lever. Install clevis pins and use new cotter pins. Apply a few drops of SAE No. 10 engine oil to clevis pins. Test shifting for proper operation. **NOTE:** Under certain operating conditions, if the transmission remote control shift rods are not properly adjusted, it is possible to engage the transmission in two gears at the same time. When this occurs it is impossible to move the vehicle. If such a condition should develop it can be corrected by disengaging the remote control shift rods from the transmission external levers, and moving the transmission external levers to the neutral position. Then adjust the remote control rods to their proper length by moving the adjustable clevises on the transmission end of the rods backward or forward until the proper length is obtained.

b. **Install Hull Floor Pan.** Place hull floor pan in position, install and tighten cap screws.

c. **Install Engine Compartment Side Panel.** Place engine compartment side panel in position, install fastening screws and tighten securely. Place rear cross shaft cover panel in position, install screws and fasten

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securely. Install spotlight wire in upper and compass light wires in lower socket. Attach harness to clips on the rear side of panel.

d. **Connect and Install Instrument Panel.** Place instrument panel in position, install screws and tighten securely. Connect primer inlet and outlet couplings at primer and tighten securely. Connect ground cable to battery terminal and tighten securely. Install primer knob on shaft at instrument panel.

e. **Install Engine Compartment Lid.** Place engine compartment lid in position, engage tongues of the lid in slots on right side of hull coaming. Lower and tighten wing nuts.

Section XII

PROPELLER SHAFT WITH UNIVERSAL JOINTS

	Paragraph
Description	30
Data	31
Trouble shooting	32
Test	33
Removal of propeller shaft with universal joints.....	34
Cleaning and inspection of propeller shaft with universal joints..	35
Disassembly of propeller shaft and universal joint parts.....	36
Cleaning of propeller shaft and universal joint parts.....	37
Inspection and repair of propeller shaft and universal joint parts	38
Assembly of propeller shaft and universal joints.....	39
Installation and test of propeller shaft with universal joints....	40

30. DESCRIPTION.

a. **Description.** The steel tubular-type propeller shaft functions to transmit power from the transmission to the axle unit. Welded to each end of the shaft is a yoke which carries two opposing journals of the universal joint crosses together with bearing assemblies. The propeller shaft is fitted with universal joints at each end to permit sidewise movement of the engine while endwise movement is permitted through the use of a splined slip joint at the front of the shaft where it joins the transmission mainshaft. Two opposed journals of each joint cross with bearings and lubricant retainers are carried in a yoke on the ends of the propeller shaft. Lock rings, fitted into recessed grooves near the outer ends of the yoke eyes, retain the bearing cups and needles in position on the cross journals. At the front joint, the other two opposed cross journals

PROPELLER SHAFT WITH UNIVERSAL JOINTS

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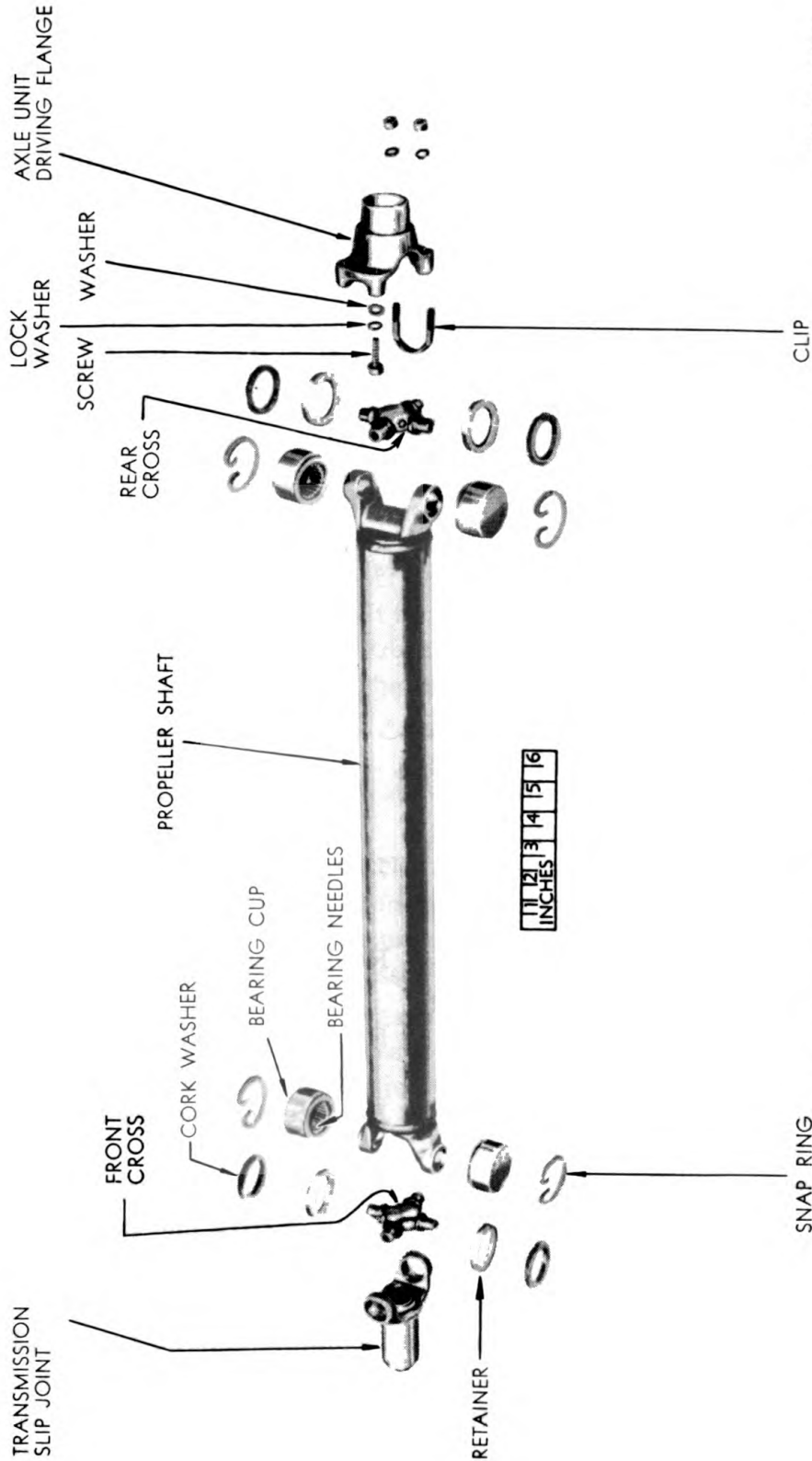


Figure 30—Propeller Shaft, Universal Joints, Transmission Slip Joint and Axle Unit Driving Flange Parts

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with bearings are carried in the yoke eyes of the transmission slip joint. The free bearings and cross journals at the rear joint are secured to the axle unit driving flange by two U-clips (fig. 30). A Zerk-type fitting on each universal joint cross permits lubrication of the joint bearings while fully assembled and in position on the vehicle. A small, hand-operated pressure gun is required to lubricate the bearings.

31. DATA.

a. Data.

(1) PROPELLER SHAFT.

Make	Spicer
Manufacturer's model series	1200
Type	Tubular
Tube diameter	2 3/4-in.
Tube wall thickness	0.065-in.
Length (center to center of crosses)	25 15/16-in.

(2) UNIVERSAL JOINT.

Make	Spicer
Type	Needle bearing
Number of needles per bearing	23
Number of bearings	8

32. TROUBLE SHOOTING.

a. Vibration.

Possible Cause	Possible Remedy
Broken weld where yoke and propeller shaft tube join.	Replace propeller shaft and joints assembly.
Bent or sprung propeller shaft.	Replace propeller shaft and joints assembly.
Broken yoke, universal joint bearing cross, axle unit flange, or transmission slip joint.	Replace parts as required.
Loose or damaged universal joint bearings.	Replace cross and bearings kit.

b. Noise.

Lubricant leakage at universal joints.	Replace cross and bearings kit.
Loose slip joint on the splined transmission mainshaft.	Replace propeller shaft and joints assembly and mainshaft, or both, as required.

PROPELLER SHAFT WITH UNIVERSAL JOINTS

33. TEST.

a. Unusual propeller shaft and universal joint conditions will be recognized as a definite vibration or a slight, metallic grinding noise. In cases where universal joint parts are damaged, or where the propeller shaft itself is sprung or bent, a visual inspection of the shaft and joints will not reveal the true condition present; therefore, it is advisable to remove the propeller shaft and universal joint assembly for a thorough inspection of the parts.

34. REMOVAL OF PROPELLER SHAFT WITH UNIVERSAL JOINTS.

a. **Remove Hull Floor Pan.** Remove screws holding floor pan to hull and remove pan.

b. **Remove Propeller Shaft with Universal Joints.** Remove the four nuts and lock washers holding the rear joint U-clips to the axle unit driving flange, and remove the U-clips. Hold the two bearings released by removal of the U-clips to prevent their falling off the cross, and tap the shaft assembly forward to free the held bearings from the retaining lugs in the axle unit driving flange. Lift the rear end of the propeller shaft and pull rearward to disengage the transmission slip joint from the transmission mainshaft splines. Lift the propeller shaft assembly out of the cockpit.

35. CLEANING AND INSPECTION OF PROPELLER SHAFT WITH UNIVERSAL JOINTS.

a. **Cleaning.** Apply SOLVENT, dry-cleaning, with a brush or cloth to remove any lubricant, dirt, or foreign matter that may have accumulated on the propeller shaft and universal joints. Dry all surfaces with wiping cloths or by using compressed air.

b. **Inspection.** Examine the assembly for cracks or external damage. Check the universal joints for excessive looseness. It is advisable to completely disassemble the shaft and joints before making a detailed inspection of the parts.

36. DISASSEMBLY OF PROPELLER SHAFT AND UNIVERSAL JOINTS.

a. **Remove Rear Universal Joint Cross from Propeller Shaft.** With the shaft and joints assembly out of the vehicle, carefully remove the free bearing assemblies from the rear joint cross. Place the shaft on a bench and grasp the loops of the front joint bearing lock rings with pliers; then compress (fig. 31) and lift the lock rings out of the propeller shaft yoke eyes. Using universal joint clamp KM-J3620 (or an arbor press) on the ends of the bearing cups and tapping on the clamp screw

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Figure 31—Universal Joint Bearing Lock Ring Removal

outer end after tightening it by hand, press one of the bearings inward toward the center of the yoke until it has cleared the yoke eye (fig. 32). To avoid interference of the grease fitting, press the cross so the fitting moves away from the nearest yoke eye. When the one bearing has been pressed inward, the opposite bearing will have been pressed outward and away from the cross into the adapter on the base of the tool. Remove the clamp and tilt the cross to lift it out of the yoke (fig. 33). Remove the bearing remaining on the cross.

b. Disassemble Front Universal Joint. To disassemble the front joint, remove the bearings that are locked in the transmission slip joint yoke eyes, and then the bearings that are locked in the shaft yoke eyes. Follow exactly the same procedure as in the removal of the rear bearing assemblies and cross.

37. CLEANING OF PROPELLER SHAFT AND UNIVERSAL JOINT PARTS.

- a.** Clean all parts carefully in SOLVENT, dry-cleaning, and blow

PROPELLER SHAFT WITH UNIVERSAL JOINTS

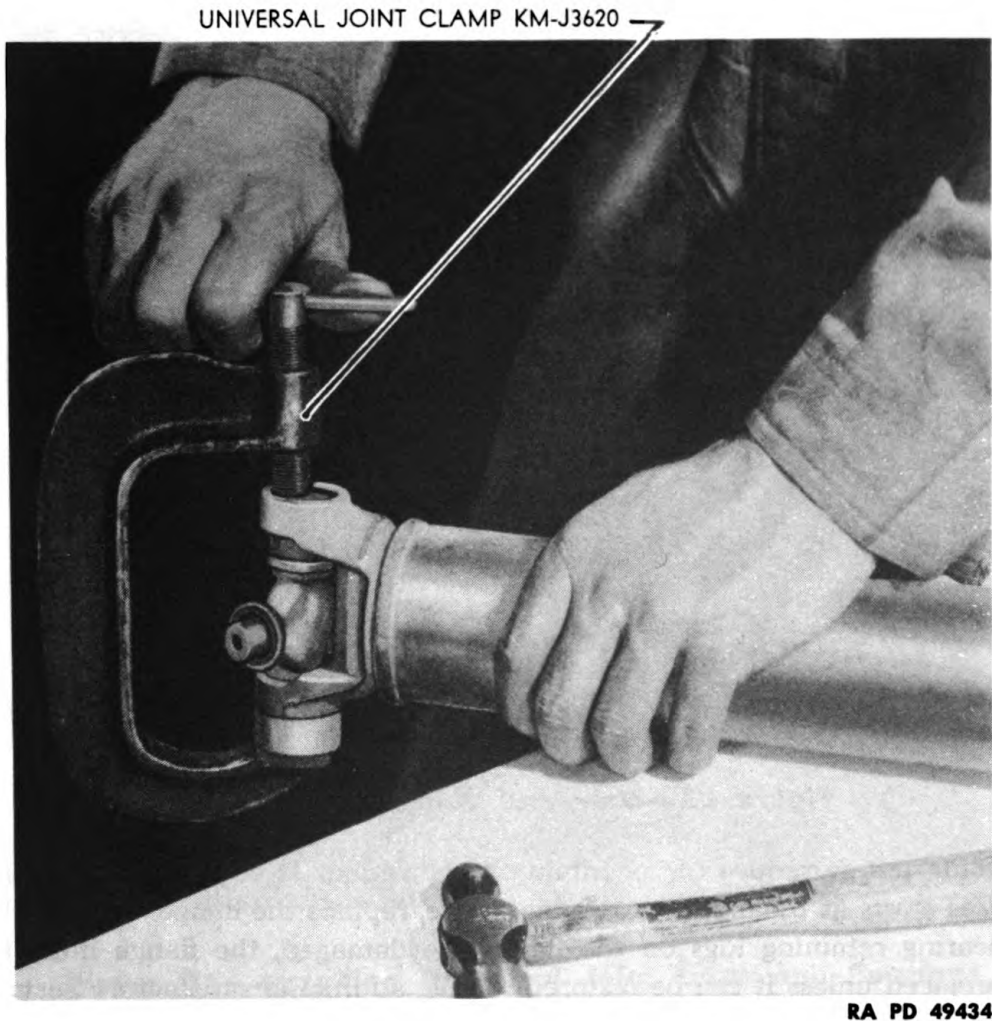


Figure 32—Method of Removing Universal Joint Bearings

them dry with compressed air. Permit the needle bearings to remain in the solvent for some time to loosen any particles of hard grease. Then use a brush having short, stiff bristles to clean the bearing parts thoroughly. Clean all grease from the passages in the crosses.

38. INSPECTION AND REPAIR OF PROPELLER SHAFT AND UNIVERSAL JOINT PARTS.

a. Propeller Shaft. A thorough inspection of the propeller shaft may reveal damaged or broken yokes, or broken welds where the yokes and propeller shaft are joined. In either case, repairs are not advisable because the balance of the propeller shaft might easily be affected and this would result in excessive vibration. Replace the assembly.

b. Transmission Slip Joint and Axle Unit Driving Flange. It is important for the axle unit driving flange to fit snugly on the axle unit

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Figure 33—Universal Joint Cross Removal

mainshaft to reduce the possibility of vibration. If any excessive looseness exists at the axle unit driving flange, replace the flange. Also, if the bearing retaining lugs on the flange are damaged, the flange must be replaced unless it can be restored to give additional satisfactory service by dressing off any burs. The transmission slip joint is splined for endwise movement on the transmission mainshaft, and the joint must slide freely. Any burs, dirt, or foreign matter affecting the free movement of the slip joint on the transmission mainshaft must be removed. Rough spots found on the area which contacts the mainshaft oil seal must be removed with emery cloth to prevent premature damage to the seal. Replace the propeller shaft and joints assembly if any condition is observed at the splines, sleeve portion, or yoke eyes of the slip joint which cannot satisfactorily be repaired.

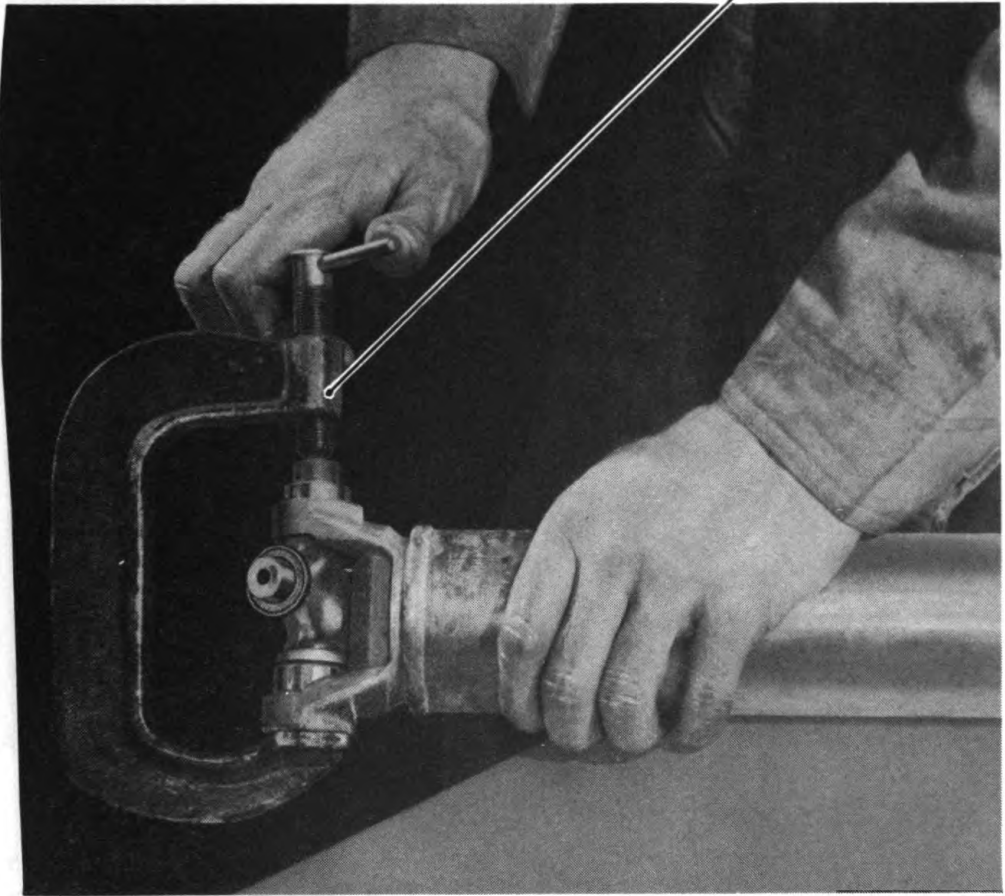
c. **Universal Joint Crosses and Bearings.** Inspect carefully for any damage to the universal joint bearing cups, bearing needles, or to the crosses. If the parts are damaged, replace them with a universal joint cross and bearings kit.

39. ASSEMBLY OF PROPELLER SHAFT AND UNIVERSAL JOINTS.

a. **Prepare Universal Joint Crosses and Bearings for Reassembly.**

PROPELLER SHAFT WITH UNIVERSAL JOINTS

UNIVERSAL JOINT CLAMP KM-J3620 (LESS ADAPTER)



RA PD 49437

Figure 34—Installing Universal Joint Cross and Bearings

Load each bearing cup with 23 needles, using a light coating of No. 0 grease in the bearing cups to hold and locate the needles; then pack the assembly with a small amount of No. 0 grease. Pack the passages in the crosses with No. 0 grease.

b. Assemble Front Universal Joint Cross to Shaft. In reassembling the component parts to the propeller shaft, place the shaft on a bench so that one yoke extends over the edge with both eyes in a vertical plane. Install a bearing lock ring in the groove in the yoke lower eye. Place a bearing cup with needle bearings on one of the cross journals, tilt the cross, and insert the opposite journal into the yoke upper eye. Straighten the cross and start the bearing assembly which is on the lower journal into the yoke lower eye. Install a bearing assembly on the upper journal and apply pressure with universal joint clamp KM-J3620 (fig. 34), less adapter (or an arbor press) to force the bearing assemblies into the yoke eyes. After tightening the clamp by hand, tap the outer end of the clamp screw with a hammer. Apply pressure until the lock ring groove in the yoke upper eye is

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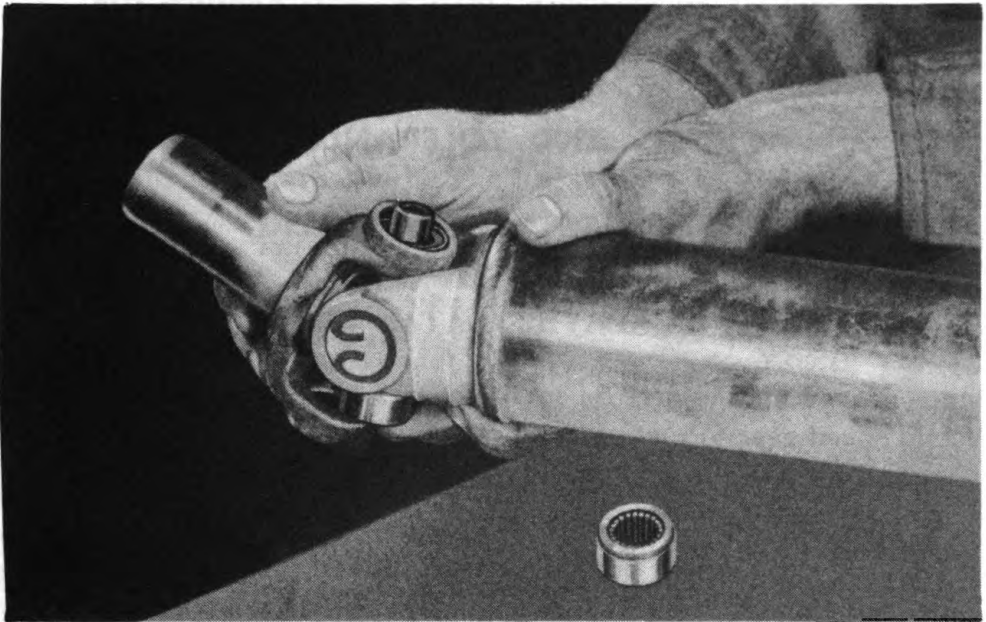
Figure 35—Eliminating Bind at Bearing Seals

clear and install a lock ring. Oscillate the cross to determine if a binding condition is present at the seals. To relieve any binding, alternately tap outward against the cross inner shoulders adjacent to the bearings (fig. 35).

c. **Assemble Transmission Slip Joint to Front Cross.** Turn the propeller shaft so that the free journals of the cross just installed are in a vertical plane. Follow the procedure outlined previously to assemble the bearings, transmission slip joint with yoke, and lock rings on the cross free journals. It will be necessary to hold the slip joint and tilt it as required while performing the installation (fig. 36). Check for free operation of the bearings in the slip joint yoke and proceed as directed previously, if a binding condition is present at the seals.

d. **Assemble Rear Universal Joint Cross to Propeller Shaft.** Assemble the remaining universal joint cross with bearings to the propeller shaft front yoke following the procedure given in step b.

PROPELLER SHAFT WITH UNIVERSAL JOINTS



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Figure 36—Slip Joint Installation on Cross

40. INSTALLATION AND TEST OF PROPELLER SHAFT WITH UNIVERSAL JOINTS.

a. **Install Propeller Shaft with Universal Joints.** Install the transmission slip joint at the front end of the propeller shaft on the transmission mainshaft splines. Lower the rear end of the propeller shaft, and with the free bearings held in place (universal joint clamp KM-J3620, less adapter), move the shaft rearward so the rear universal joint free bearings enter the recesses in the axle unit driving flange. Tighten the clamp as necessary so the bearings will seat properly between the bearing retaining lugs in the driving flange recesses. Install the U-clips and nuts with lock washers and tighten the nuts securely. Remove the universal joint clamp.

b. **Test Propeller Shaft with Universal Joints.** Shift the axle transmission unit to its neutral position and start the engine. Test the operation of the propeller shaft and universal joints first by engaging various engine transmission gears, in order to turn the propeller shaft assembly in both directions and at different speeds. Make a final test by operating the vehicle.

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Section XIII

FITS AND TOLERANCES

	Paragraph
Transmission service data	41
Propeller shaft and universal joints service data	42

41. TRANSMISSION SERVICE DATA.

Location	Minimum Backlash
Pinion gear to mating gear on countershaft	0.004-0.008 in.
Second speed gear to mating gear on countershaft	0.004-0.008 in.
Synchronizer sleeve to gear on countershaft	0.000-0.001 in.
Synchronizer gear to mainshaft	0.002-0.006 in.
Synchronizer sleeve to blocking rings	0.008-0.016 in.
Low and reverse sliding gear to mainshaft	0.004-0.006 in.
Pinion end play	Use bearing retainer and lock rings of required thickness to eliminate end play, but without binding bearing.
Mainshaft end play	Use bearing lock ring of required thickness to eliminate end play, but without binding bearing.

**42. PROPELLER SHAFT AND UNIVERSAL JOINTS SERVICE
DATA.**

Location	Minimum Backlash
Bearing to propeller shaft joint cross clearance	0.020-0.015 in.
Bearing needles maximum diameter	0.09375 in.
Maximum permissible unbalance of propeller shaft with slip joint and driving flange assembled	$\frac{1}{2}$ oz-in.

CHAPTER THREE

AXLE DIFFERENTIAL AND TRANSMISSION WITH FINAL DRIVES

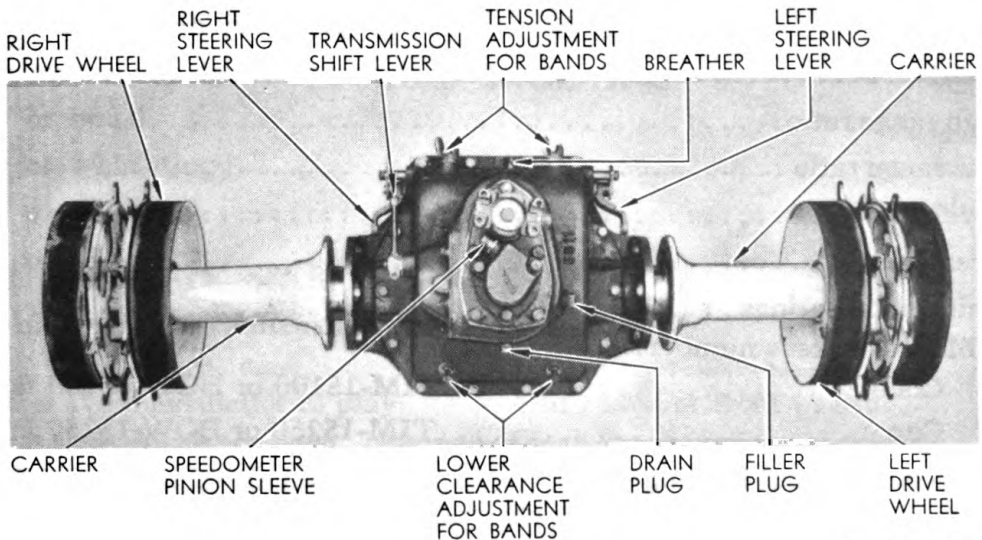
Section I

DESCRIPTION AND DATA

	Paragraph
Description and operation.....	43
Data.....	44

43. DESCRIPTION AND OPERATION.

a. The axle unit and final drives are located at the rear and transmit engine power to the vehicle tracks. The axle unit is composed of a two-speed transmission, an integral controlled differential with planetary gearing, and two brake drums with band levers for power steering as well as braking. The final drive consists of wheel carrier housings which bolt through the hull to the side flanges of the axle unit, axle shafts, and track drive wheels. A lubricant filler and drain plug are provided.



RA PD 67042

Figure 37—Controlled Differential and Transmission Assembly with Final Drive Assemblies

b. Engine power, carried rearward by the propeller shaft from the transmission, is delivered at the front end of the axle unit transmission mainshaft. Splined to the mainshaft, which is carried on opposed tapered roller bearings, are two helical-cut gears of different size; the larger or high-speed gear at the front, and the smaller or low-speed gear at the rear. Axle drive pinion gears, having internal teeth, are carried on bearing rollers, and are constantly meshed with the mainshaft gears. A sliding

clutch gear is used to connect the pinion shaft to the mainshaft gears. After being energized by one of the mainshaft gears, the pinion engaged with its bevel drive (ring) gear rotates the drive wheels and vehicle tracks through a system of planetary differential gears and drive shafts.

c. At each side of the differential the two planetary driving elements terminate within a brake drum, which is connected by means of its integral hub gear to planet gears. These gears in turn are keyed to the planet pinions which drive the axle shaft gears carried in a center member to which are mounted the left housing and right housing with bevel drive gear. The axle shaft gears are splined to drive the axle shafts which are connected by means of flanges to the track drive wheels.

Make **Clark**

Model **3-127D-1**

Type..... **Integral transmission and
planetary differential**

Speeds.....High and low range

High range ratio 0.866 to 1

Low range ratio 2.74 to 1

Bevel gear ratio 4.87 to 1

Steering ratio.....1.73 to 1

Mainshaft bearings 2

Manufacturer's number:

Cone.....TIM-15100 or BOW-15100 BT

Cup.....TIM-15250 or BOW-15250 BT

Drive pinion front bearing

Manufacturer's number:

ConeTIM-3876

Cup **TIM-3821**

Differential side bearings 2

Manufacturer's number:

Cone TIM-25581

Cup **TIM-25520**

Drive wheel bearings (inner) 2

Manufacturer's number:

Cone.....TIM-387-A or BOW-BT-387-A

Cup.....TIM-382 or BOW-BT-382

AXLE DIFFERENTIAL AND TRANSMISSION

Drive wheel bearings (outer)

Manufacturer's number:

Cone.....TIM-359-S or BOW-BT-359-S

Cup.....TIM-354-A or BOW-BT-354-A

Pinion high speed gear bearing rollers.....22

Type Needle

Diameter $\frac{3}{16}$ in.

Length 1 in.

Pinion low speed gear bearing rollers.....34

Type Needle

Diameter 0.1873 in.

Length 1.1875 in.

Steering brake band linings.....2

Width 2 in.

Length 11 in.

Thickness $\frac{1}{4}$ in.

Section II

TROUBLE SHOOTING

	Paragraph
Trouble shooting	45
Test.....	46

45. TROUBLE SHOOTING.

a. Noisy in Neutral.

Possible Cause	Possible Remedy
Excessive mainshaft end play.	Add shims at front bearing.
Mainshaft front or rear bearing dirty, rough, or damaged.	Clean or replace as required.
Teeth on mainshaft or pinion constant mesh gears scuffed, chipped, butted, or damaged.	Replace gears as required.
Bearing rollers at pinion low- or high-speed gears scored, rough, or damaged.	Replace bearing rollers.
Constant mesh gears not properly meshed or matched.	Replace gears.
Replacement of only one constant mesh gear instead of both gears.	Replace both gears.
Excessive lash in constant mesh gears.	Replace gears.

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Possible Cause

Possible Remedy

Insufficient lubricant in axle unit.
Incorrect grade or dirty lubricant in axle unit.

Fill to recommended level.
Drain, flush axle unit, and replace lubricant.

b. Noisy in Gear.

Excessive axle transmission pinion end play.

Tighten pinion bearing adjusting nut.

Axle transmission pinion front or rear bearing, dirty, rough, damaged.

Clean or replace as required.

Teeth on clutch gear or internal teeth on pinion low- or high-speed gears scuffed, or burred.

Replace gears as required.

Excessive lash at pinion and bevel drive gear.

Remove shim at right differential side bearing and install on left side.

Pinion or bevel drive gear teeth chipped, scuffed, or burred.

Replace pinion and bevel drive gear.

Excessive clearance at either axle shaft and differential side gear splines.

Replace shaft or gear as required.

Teeth on differential side gears, planet pinions, planet gears, or steering brake drum gear chipped, scuffed, or burred.

Replace gears or drum as required.

Differential side bearings dirty, rough or damaged.

Clean or replace as required.

Damaged bushings in differential or steering brake drums.

Replace bushings as required.

c. Oil Leaks.

Lubricant level too high.

Drain to proper level.

Damaged, improperly installed, or missing gaskets.

Replace or install properly as required.

Damaged or improperly installed mainshaft oil seal.

Replace or reinstall as required.

Axle unit drain or filler plug loose or threads damaged.

Tighten or replace plug as necessary.

Axle unit housing, case, or cover screws loose, missing, or threads stripped.

Tighten or replace screws.

Sand hole or crack in housing, case, or covers.

Replace parts as required.

TROUBLE SHOOTING

Possible Cause	Possible Remedy
Use of lubricant which foams excessively.	Drain and refill axle unit with recommended lubricant.
Restriction in axle housing breather cap causing excessive pressure in housing.	Remove cap and either remove restriction or install new cap.
d. Difficult to Shift into Gear.	
Insufficient chamfer at edges of shift rod center ball notch.	Smooth edges of notches or replace shift rod and ball as required.
Shift rod ball burred, chipped, or damaged.	Replace ball.
Pinion splines burred or damaged.	Clean, dress down, or replace pinion as required.
Clutch gear tight on pinion splines.	Clean, dress down, or replace clutch gear.
Insufficient chamfer on clutch gear teeth or in internal teeth of low or high speed pinion gears.	Replace gears as required.
Lubricant too heavy.	Change to proper grade.
e. Sticks in Gear.	
Insufficient chamfer at edges or damaged.	Smooth edges of notches or replace pinion as required.
Shift rod ball burred, chipped or damaged.	Replace ball.
Pinion splines distorted, burred, or damaged.	Clean, dress down, or replace pinion as required.
Clutch gear tight on pinion splines.	Clean, dress down, or replace clutch gear.
Lubricant too heavy.	Change to proper grade.
f. Slips Out of Gear.	
Insufficient spring tension on shift rod ball.	Replace spring.
Excessive chamfer on edges of shift rod ball notches.	Replace shift rod.
Teeth on clutch gear or internal teeth on low or high speed gears damaged.	Replace gears as required.
g. Unsatisfactory Steering and Braking.	
Insufficient tension on steering brake bands.	Adjust band tension.
Worn steering brake band linings.	Reline bands.

ORDNANCE MAINTENANCE POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24

Possible Cause	Possible Remedy
Incorrect installation of steering brake cam shafts.	Reinstall, adjust band tension, and check for proper operation.
Steering brake cam shaft splines or cam splines damaged.	Replace parts as required.
Differential side gears, planet pinions, planet gears, or steering brake drum gears damaged.	Replace parts as required.

h. Noisy Drive Wheels.

Excessive drive wheel end play.	Readjust at wheel bearing nut.
Wheel bearings extremely dirty or rough.	Clean or replace bearings as required.
Wheel belt bands worn away.	Replace wheel.
Wheel drive sprockets damaged or chipped away.	Replace drive wheel.

i. Drive Wheels Will Not Rotate with Power Complete to Differential.

Drive shaft broken.	Replace drive shaft.
Drive shaft flange cap screws sheared off.	Install new drive shaft flange cap screws.
Bevel drive gear or pinion teeth stripped.	Replace bevel drive gear and pinion.

46. TEST.

a. With the engine operating, the vehicle transmission engaged, and the axle unit shift lever in its neutral (midway) position, unusual operating noises emanating from the axle unit two-speed transmission may be detected. This test should be made in an effort to locate the difficulty in the axle transmission, as distinguished from the axle differential, prior to removing the axle unit from the vehicle. On the other hand, the operating check may reveal the source of the difficulty at some one of the other units in the drive line such as the propeller shaft and joints, transmission, or engine clutch.

Section III

FINAL DRIVES REMOVAL

Remove final drives.	Paragraph 47
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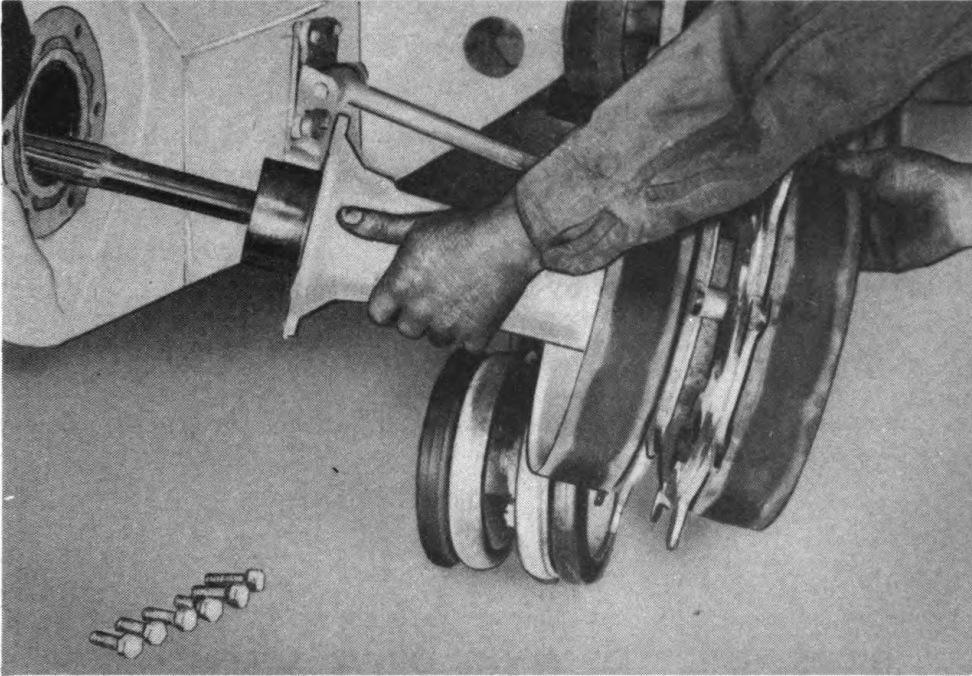
47. REMOVE FINAL DRIVES.

a. **Remove Hull Floor Pan.** If seat is attached to the floor pan, loosen and remove it. Remove all the cap screws that hold the floor pan and then remove the floor pan section.

FINAL DRIVES REMOVAL

b. Remove Tracks. Refer to paragraph 89.

c. Remove Drive Wheel and Carrier Assemblies. While an assistant holds the bolt nuts inside the cockpit, remove the bolts, copper washers, and lock washers that hold the wheel carrier flange to the axle unit housing flange. Before removing all bolts, install two guide pins, approximately 8 inches long and tapered on the ends, in two of the bolt holes on each side. Install the pins directly opposite each other, to hold the spacer



RA PD 67079

Figure 38—Final Drive Assembly Removal

shims in place and preserve alinement of the axle unit in the hull. The locating pins will also facilitate assembly. Remove the last bolt and nut from each side and pull the drive wheel and carrier assemblies outward to remove them from the axle unit. If difficulty is encountered in removing these assemblies, pressure may be applied with two small hydraulic jacks placed with their bases blocked against the hull and pads against the drive wheel. A large drift and a heavy hammer may also be used to help in the removal of the assemblies. **NOTE:** If the axle unit is to be removed at this time, it is advisable to support the weight of the axle in its position in the hull with a suitable lifting hoist before removing all of the bolts from the final drive housing flanges.

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Section IV

FINAL DRIVES CLEANING AND INSPECTION

	Paragraph
Cleaning	48
Inspection	49

48. CLEANING.

a. Apply SOLVENT, dry-cleaning, with a brush or cloth to soak off any lubricant, dirt, or foreign matter that may have accumulated on the exterior metal surfaces of the drive wheels or carriers. Insofar as possible, do not permit any solvent to collect on the wheel rubber coverings. Dry all surfaces with wiping cloths or by using compressed air.

49. INSPECTION.

a. Inspect the drive wheel and carrier assemblies for cracks, oil seepage, or any external damage.

Section V

DISASSEMBLY OF FINAL DRIVE ASSEMBLIES

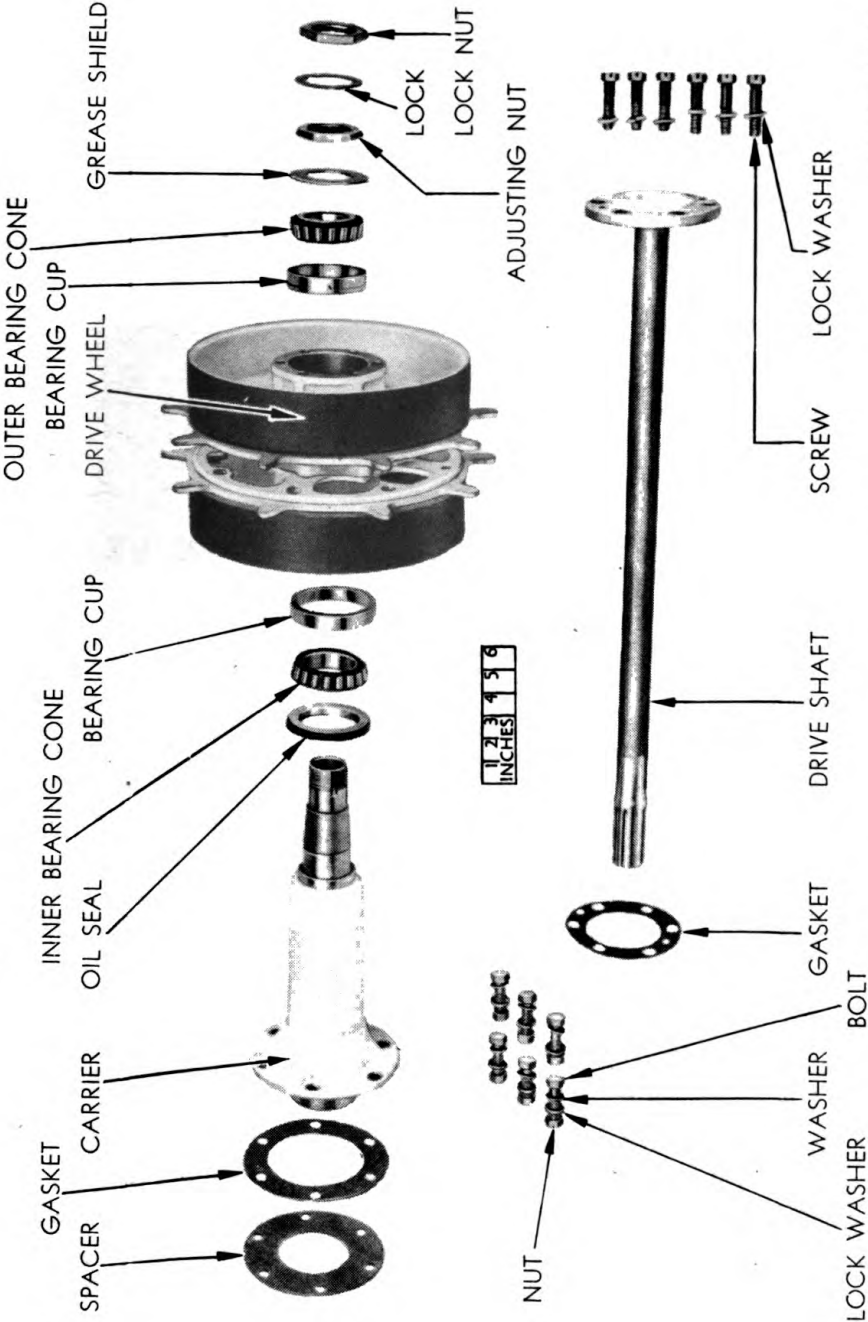
	Paragraph
Disassembly	50

50. DISASSEMBLY.

a. Remove Drive Shaft (fig. 39). Remove the drive shaft flange screws. If the drive shaft cannot be removed by hand, install two $\frac{3}{8}$ -inch cap screws in the threaded holes in the drive shaft flanges and turn the screws clockwise to push the flange away from the drive wheel hub. Pull the drive shaft out of the drive wheel carrier, remove pusher screws, and screw off flange gasket. Repeat the procedure to remove the other drive shaft if required.

b. Remove Drive Wheel and Bearings from Carrier (fig. 39). Unlock and remove drive wheel bearing lock nut, lock, and adjusting nut, using adjusting nut wrench KM-J3603. Remove the drive wheel with bearing cups. With a screwdriver pry the inner bearing cone and oil seal from the carrier spindle. The bearing cups may be removed for inspection or replacement with a brass drift and a hammer. Repeat the procedure outlined to remove the other drive wheel and bearing if required.

DISASSEMBLY OF FINAL DRIVE ASSEMBLIES



RA PD 67169

Figure 39—Parts of the Final Drive

**ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
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Section VI

CLEANING OF FINAL DRIVE PARTS

	Paragraph
Cleaning	51

51. CLEANING.

a. Clean the shafts, wheels, and carriers carefully with SOLVENT, dry-cleaning, and blow them dry with compressed air. Immerse the bearing cones in cleaning solvent and again wash them to remove all traces of lubricant or dirt. Blow dry with compressed air, being careful not to direct the air at the side or face of the cone to avoid spinning.

Section VII

INSPECTION AND REPAIR OF FINAL DRIVE PARTS

	Paragraph
Drive shaft	52
Drive wheel	53
Carrier	54
Bearings	55

52. DRIVE SHAFT.

a. **Inspection and Repair.** Inspect the shafts thoroughly for evidence of fracture, twisted splines, or burs on the machined surface of the flanges. Remove any burs on the flange surface that contact the gasket by machining or filing. If there is any evidence of fracture or twisted splines, replace the shafts.

53. DRIVE WHEEL.

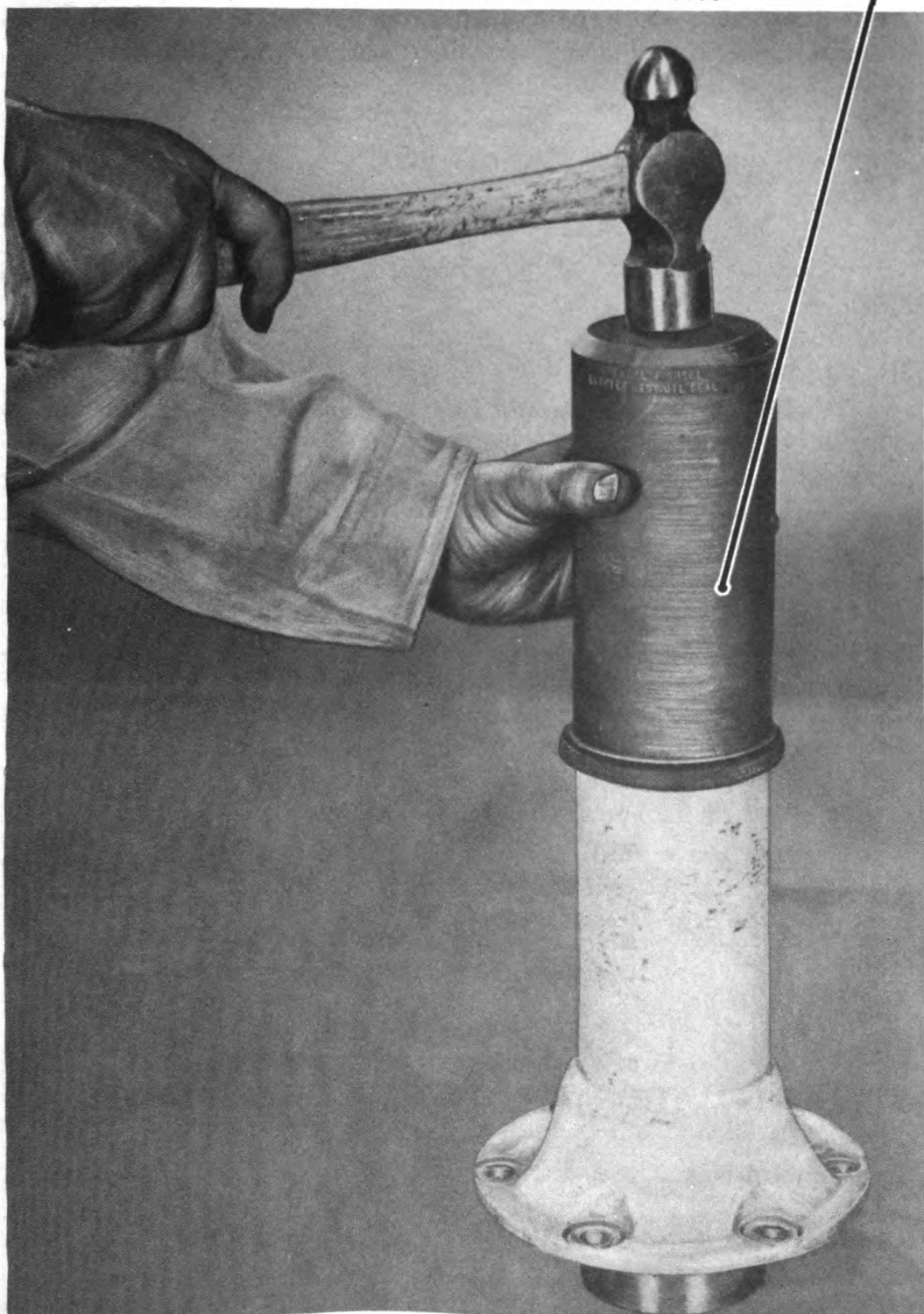
a. **Inspection and Repair.** Inspect the drive wheels for cracks, distortion, or damage. Weld any cracks found in the drive wheels, provided they can be repaired to give additional satisfactory service. If the drive wheels are distorted or damaged, replace them.

54. CARRIER.

a. **Inspection and Repair.** Inspect the carriers for burs, cracks, or damage, and make sure that the baffle oil drain hole inside the inner end of the carrier is not obstructed. Remove any burs by machining or filing. If the carriers are cracked or damaged and cannot be satisfactorily repaired by welding, replace them.

INSPECTION AND REPAIR OF FINAL DRIVE PARTS

DRIVE WHEEL CARRIER
OIL SEAL REPLACER KM-J3636



RA PD 67140

Figure 40—Installing Drive Wheel Carrier Oil Seal

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55. BEARINGS.

a. **Inspection and Repair.** Inspect the bearing cones and cups, and if scored, damaged, or if the roller retainers are loose, replace them.

Section VIII

ASSEMBLY OF FINAL DRIVES

	Paragraph
Assembly	56

56. ASSEMBLY.

a. **Install Drive Wheels and Bearings on Carriers.** Place a new drive wheel oil seal over carrier spindle and drive it into position with replacer KM-J3636 (fig. 40). Carefully install the bearing cups by driving them into position in the drive wheel hub, using KM-J3608 for outer and KM-J3609 for inner cups. Pack the inside of the drive wheel hub with No. 0 grease until level with inside diameter of bearing cups. Pack inner and outer bearings cones with No. 0 grease and slide inner bearing cone into place on the carrier spindle. Install drive wheel, outer bearing cone, grease shield and bearing adjusting nut on carrier spindle. Adjust drive wheel bearings, using wrench KM-J3603, until they are seated firmly and the wheel turns hard; then back off adjusting nut $\frac{1}{6}$ turn. Install a new nut lock with the lock nut, and lock both nuts in place by bending a portion of the lock over a flat surface on each of the nuts.

b. **Install Drive Shaft.** Place a new gasket on the drive wheel hub, and seal with joint and thread compound. Carefully install the drive shaft and tighten the flange screws securely.

Section IX

INSTALLATION AND TEST OF FINAL DRIVES

	Paragraph
Install final drives	57

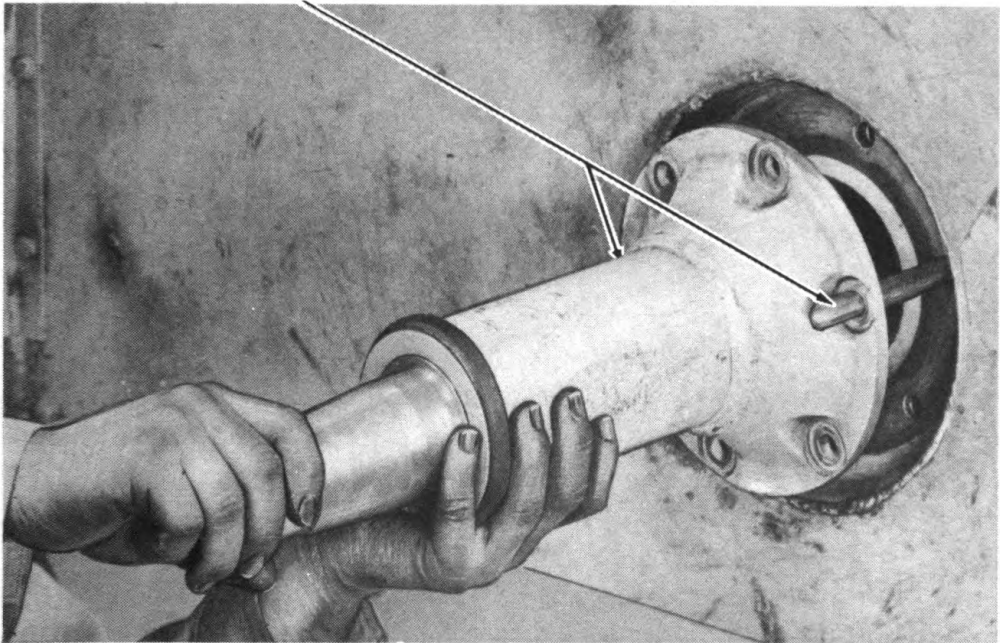
57. INSTALL FINAL DRIVES.

a. **Install Drive Wheel and Carrier Assemblies.** Install a new gasket in place around the hull opening. Coat gasket with joint and thread compound. Lift one of the drive wheel and carrier assemblies (make sure that the wheel carrier inner oil drain hole points downward) and enter

INSTALLATION AND TEST OF FINAL DRIVES

splined end of the axle shaft through the opening in the hull and into the axle unit housing. Move carrier flange toward the hull until locating pins enter bolt holes in flange. When splined end of axle shaft is against differential axle shaft gear, turn the drive wheel until splines mesh, and push assembly in until flange on wheel carrier is against gasket on the outside of

GUIDE PINS KM-J3610



RA PD 67189

Figure 41—Installing Drive Wheel Carrier

the hull. Insert bolts and new copper washers through holes from outside while an assistant installs the lock washers and nuts inside the cockpit. Repeat the procedure to install the other drive wheel and carrier assembly. Tighten attaching bolts and nuts securely and fill the axle unit to the proper level with SAE No. 10 engine oil.

- b. **Install Tracks.** Refer to paragraph 91.
- c. **Install Axle Cover.** Place cover in position, install cap screws and tighten securely.
- d. **Install Hull Floor Pan.** Position pan in hull and install cap screws and tighten.
- e. **Install Top and Bows.** Place bows in sockets and cotter key. Place top in position and fasten lashings securely.
- f. **Install Rear Seats.** Place seats in position and engage ears in slots.
- g. **Test.** Start the engine and test the operation of the final drives by running the vehicle.

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Section X

AXLE DIFFERENTIAL AND TRANSMISSION REMOVAL

	Paragraph
Remove axle unit.....	58

58. REMOVE AXLE UNIT.

- a. Remove Top and Bows. Loosen wing nuts at windshield, remove cotter keys from bow sockets, loosen lashings and remove top and bows.
- b. Remove Seats and Floor Pan. Remove cap screws holding pan to floor and remove pan.
- c. Remove Propeller Shaft. Refer to paragraph 34.
- d. Remove Axle Cover. Take out cap screws holding cover and remove cover.
- e. Remove Tracks. Refer to paragraph 89.
- f. Disconnect Axle Unit for Removal. Disconnect transmission remote control shift rods by removing the cotter pins and clevis pins. Remove shift rod guide and shift rods. Loosen speedometer cable nut from sleeve and move cable end away from the axle unit.
- g. Remove Final Drives. Refer to paragraph 47.
- h. Remove Axle Unit from Vehicle. With a suitable hoist and KM-J3802 sling raise the axle unit carefully and remove the axle unit from the vehicle (fig. 42). Tag the hull spacer shims for proper location on re-assembly. Remove drain plug from the bottom of the case and drain the lubricant. Place the axle unit on a suitable bench and remove the lifting chain.

Section XI

AXLE DIFFERENTIAL AND TRANSMISSION
CLEANING AND INSPECTION

	Paragraph
Cleaning	59
Inspection.....	60

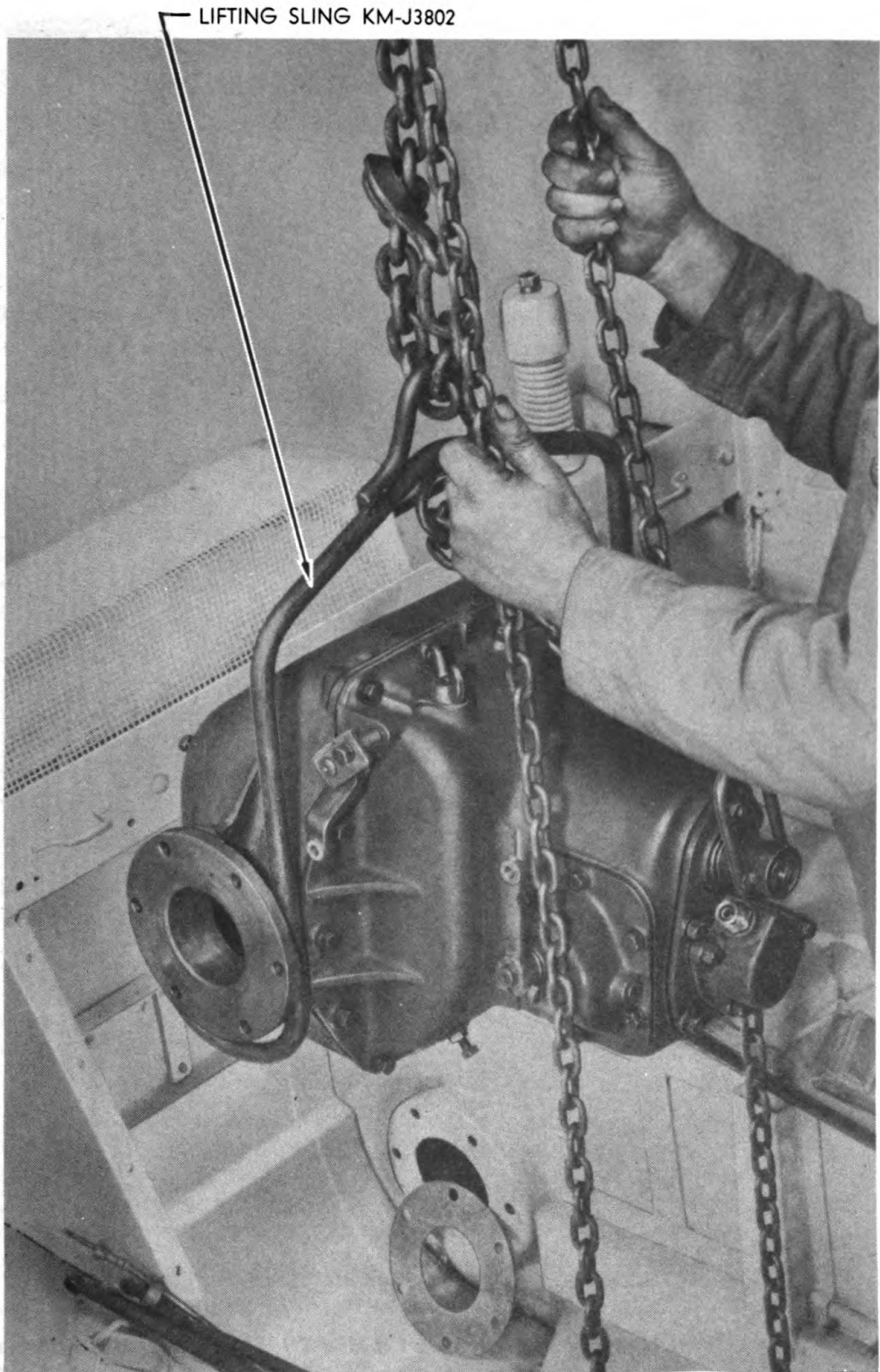
59. CLEANING.

- a. Apply SOLVENT, dry-cleaning, with a brush or cloth to remove any lubricant, dirt, or foreign matter that may have accumulated on the exterior of the axle unit. Dry all surfaces with wiping cloths or by using compressed air.

60. INSPECTION.

- a. Inspect the housing and case for cracks, oil seepage, or external damage.

**AXLE DIFFERENTIAL AND TRANSMISSION
CLEANING AND INSPECTION**



RA PD 67076

Figure 42—Controlled Differential Unit Removal

**ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**

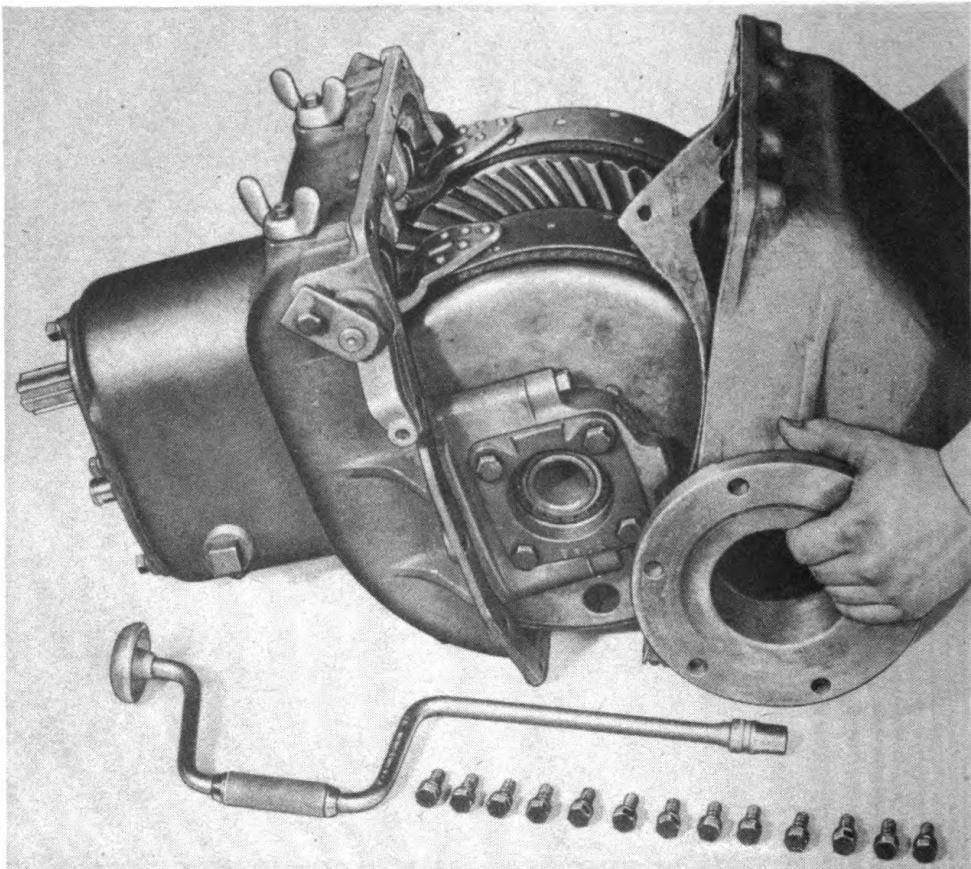
Section XII

**DISASSEMBLY OF AXLE DIFFERENTIAL
AND TRANSMISSION**

Disassembly.....	Paragraph 61
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61. DISASSEMBLY.

- a. **Remove Axle Housing (fig. 43).** Take out the cap screws and lock washers and remove housing by striking sharply with a lead or copper hammer to loosen it from the case assembly.

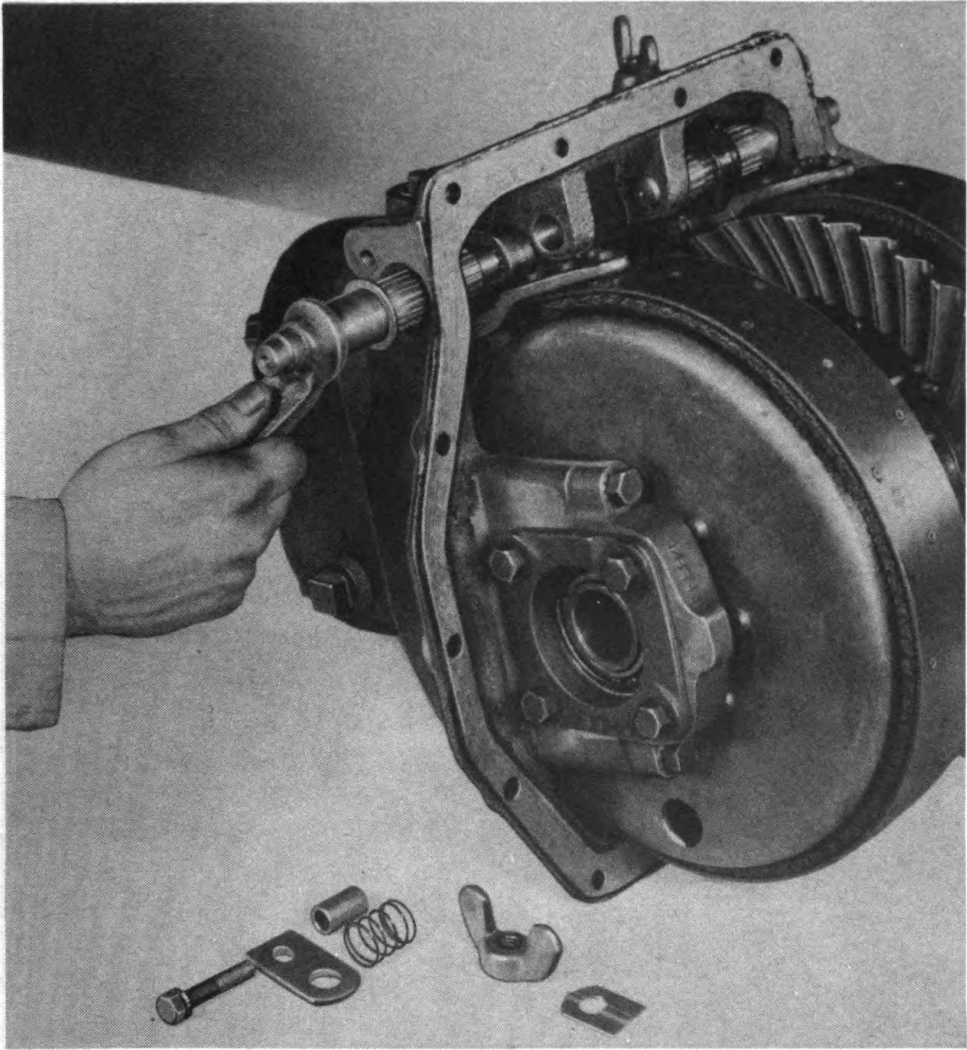


RA PD 67178

Figure 43—Controlled Differential Housing Removal

- b. **Remove Steering Lever and Camshaft (fig. 44).** Remove cap screw, retaining plate, and coil tension spring on one of the steering brake levers with camshaft. Pull camshaft from driving case. Repeat the procedure to remove the other lever with camshaft.

DISASSEMBLY OF AXLE DIFFERENTIAL AND TRANSMISSION

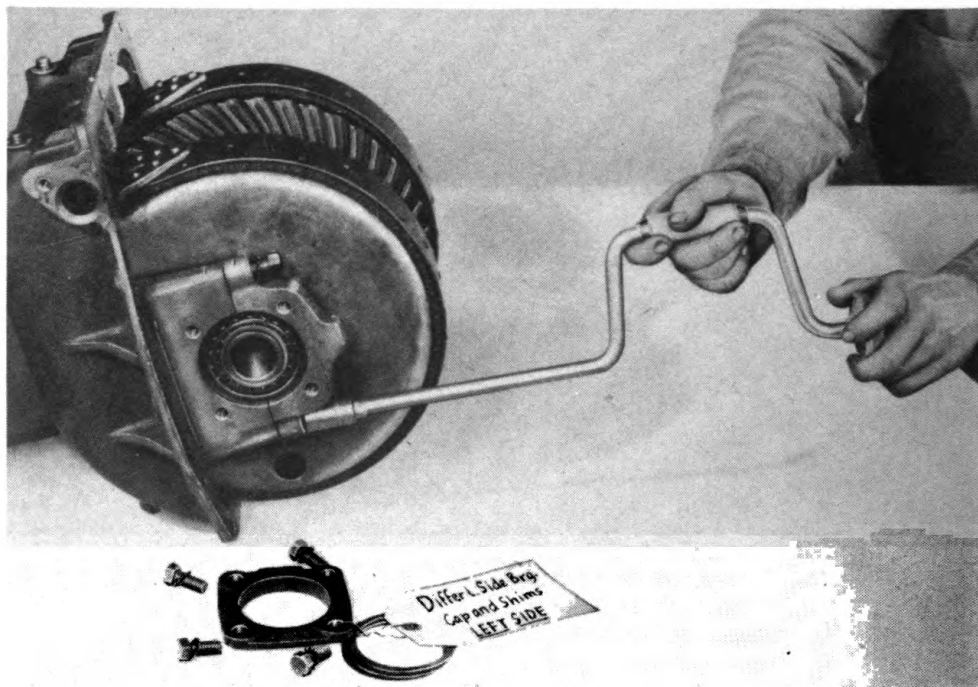


RA PD 67165

Figure 44—Steering Brake Camshaft Removal

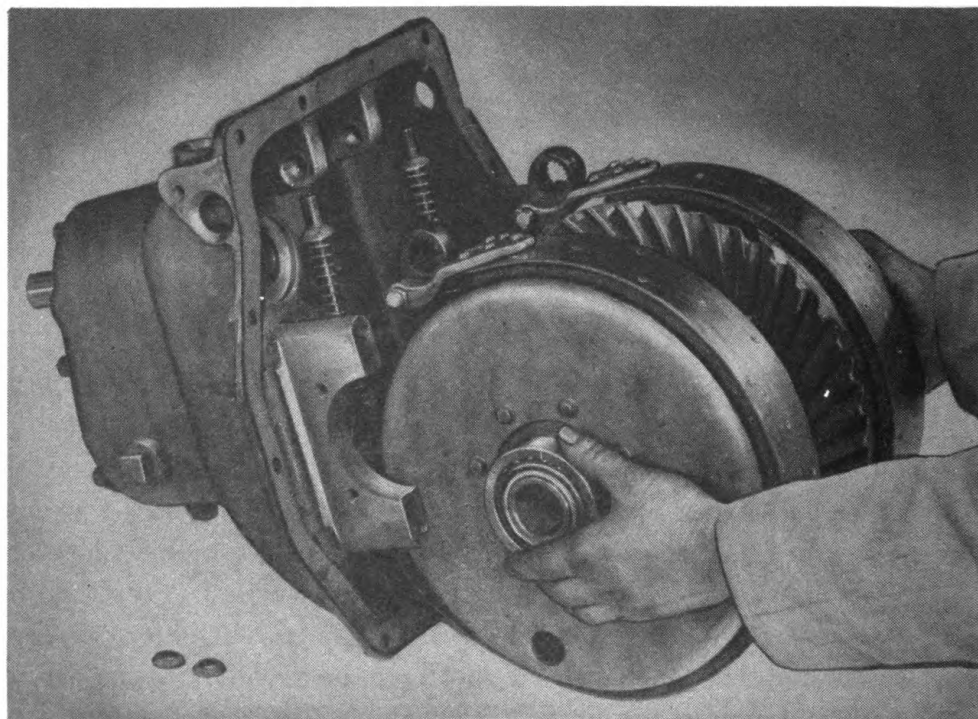
c. **Remove Differential Assembly.** Remove brake band tension adjusting wing nut and adjusting lock plate from one of the brake band studs. Remove the steering brake camshaft and cork seal. Repeat the steps at the other brake band. Loosen the four differential side bearing (cone) retainer plate screws and remove screws with internal lock washers, plate and shims. Tag the shims and plate so they will be installed in their proper location on reassembly. Mark cap for reassembly identification. Remove cap screws and internal lock washers that hold the differential side bearing cap in place and remove the cap (fig. 45). Repeat the steps to remove the other differential side bearing cap. Pull differential assembly with brake bands out of case, and remove brake bands from the drums (fig. 46).

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RA PD 67129

Figure 45—Differential Side Bearing Cap Removal



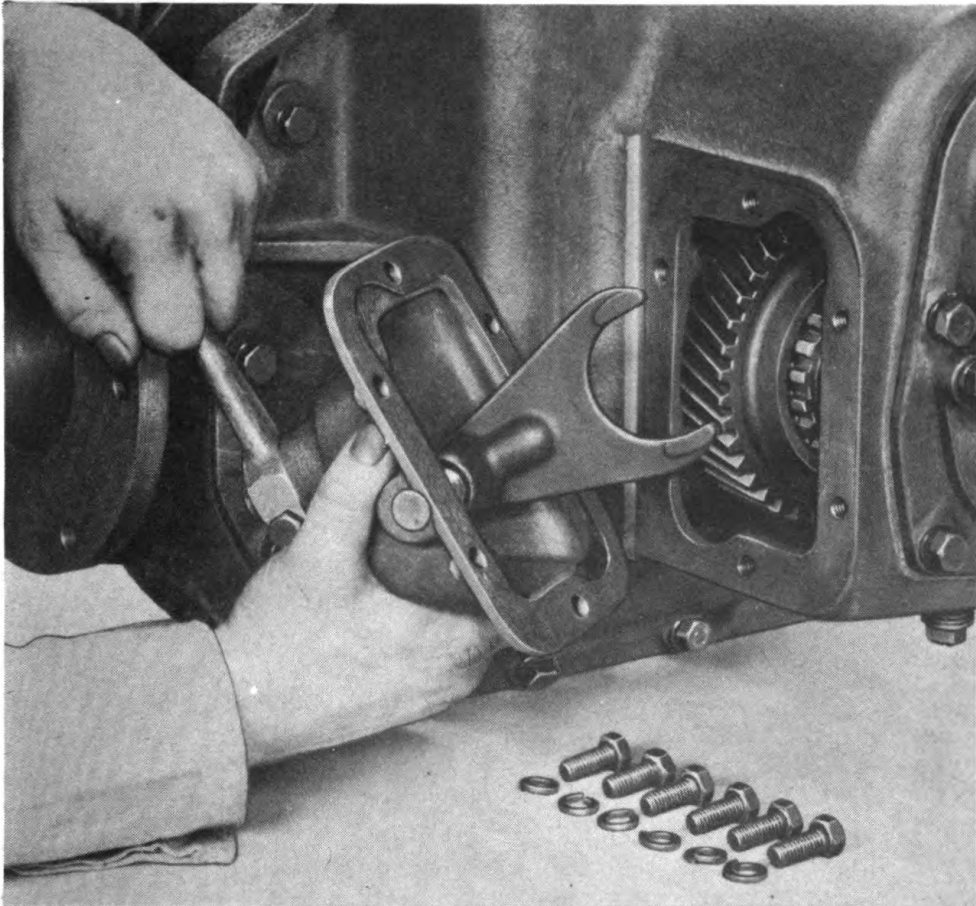
RA PD 67126

**Figure 46—Differential Assembly with Brake Bands
Removal from Case**

DISASSEMBLY OF AXLE DIFFERENTIAL AND TRANSMISSION

d. **Remove Axle Unit Driving Flange.** Remove the cap screw and washers holding the driving flange to the axle unit mainshaft, and pull or drive the flange from splines on mainshaft.

e. **Remove Axle Transmission Shift Cover Assembly.** Take out cap screws with lock washers and remove shift cover assembly with gasket (fig. 47).



RA PD 67180

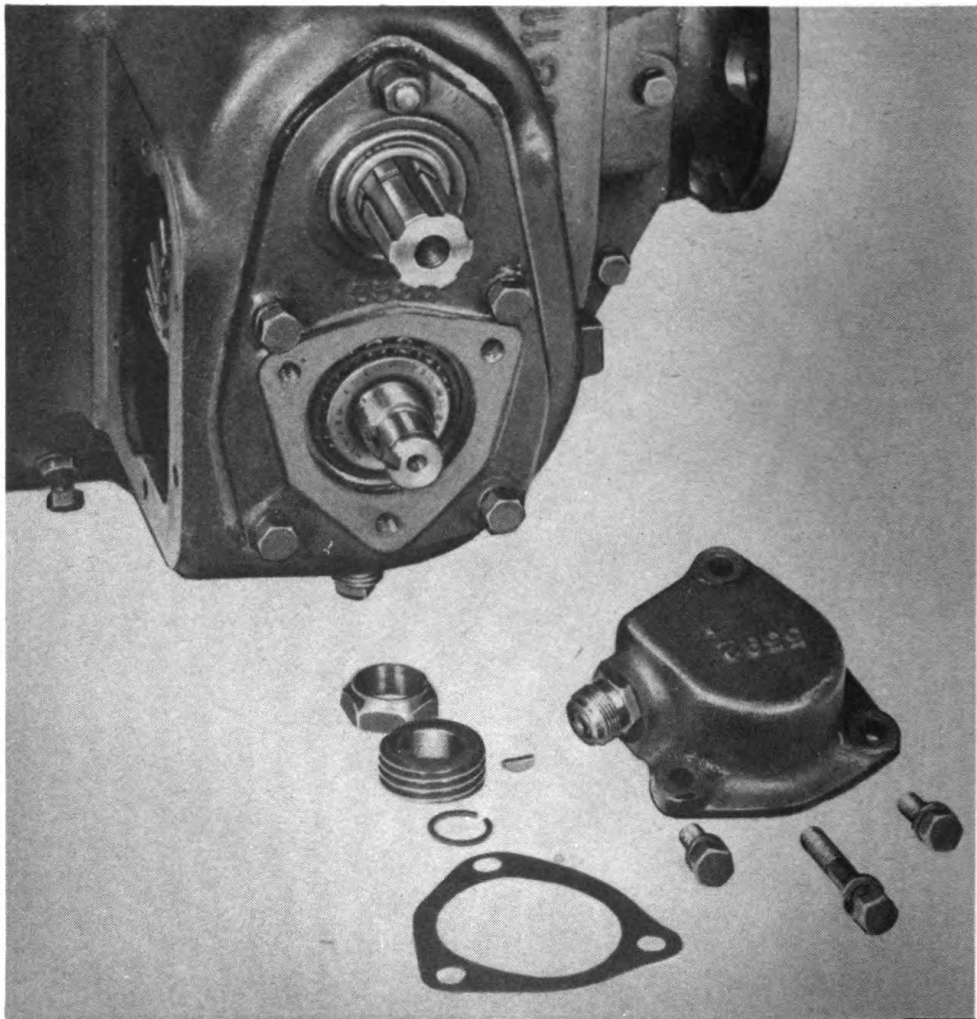
Figure 47—Shift Cover Assembly Removal

f. **Remove Axle Transmission Pinion Rear Bearing Cap Assembly.** Loosen speedometer pinion sleeve in bearing cap. Remove cap screws with lock washers, and lift off cap assembly and gasket.

g. **Remove Axle Transmission Pinion, Bearings and Gears.** Remove speedometer drive gear snap ring and lift gear (number side out) off end of the pinion. Remove the Woodruff key from keyway. Unstake and remove pinion rear bearing adjusting nut (fig. 48). Move sliding gear into engagement with high-speed gear for access to the low-speed gear bearing snap ring. To remove the snap ring use a narrow-blade cold chisel, placing

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the chisel against the ring opposite the gap, and cutting the ring to weaken and spread it (fig. 49). Pry ring out of the groove and move it toward sliding gear. Remove axle transmission front cover plate by first removing the cap screws with lock washers, and a nut with lock washer; then use puller

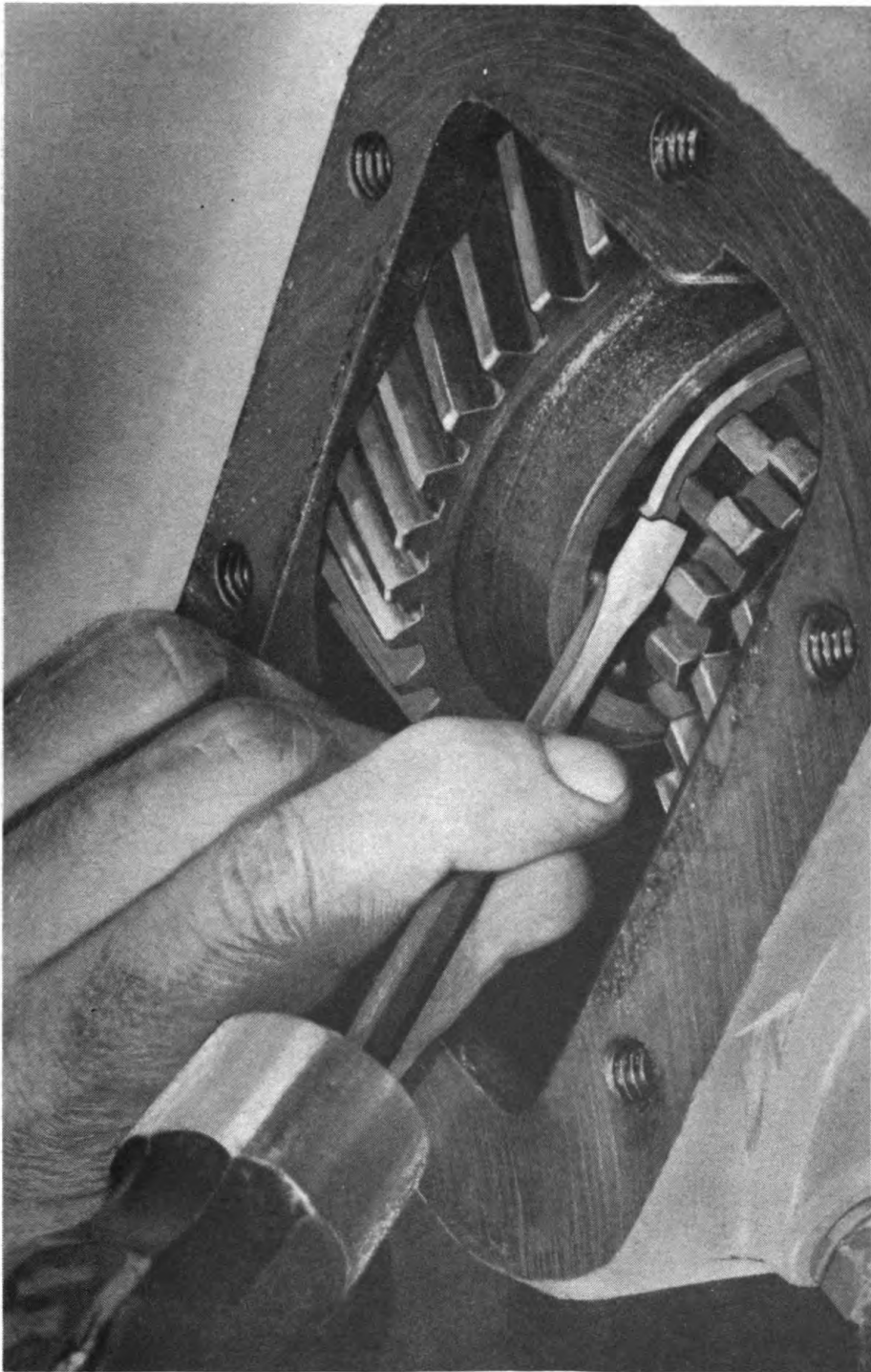


RA PD 67179

Figure 48—Pinion Front Bearing Cap, Speedometer Drive Gear, and Bearing Adjusting Nut Removed

KM-J3640 to remove the cover plate and pinion front bearing (fig. 50). Remove cover plate gasket and shims from the mainshaft front bearing. Pull pinion carefully out of the case to avoid losing any bearing rollers. Lift sliding gear, spring washer, thrust washer, and high-speed gear with locating washer from the case. Tilt low-speed gear as required in order to work it out of case opening. From inside the case, remove the long rollers used in the low-speed gear and the short rollers used in the high-speed gear.

**DISASSEMBLY OF AXLE DIFFERENTIAL
AND TRANSMISSION**

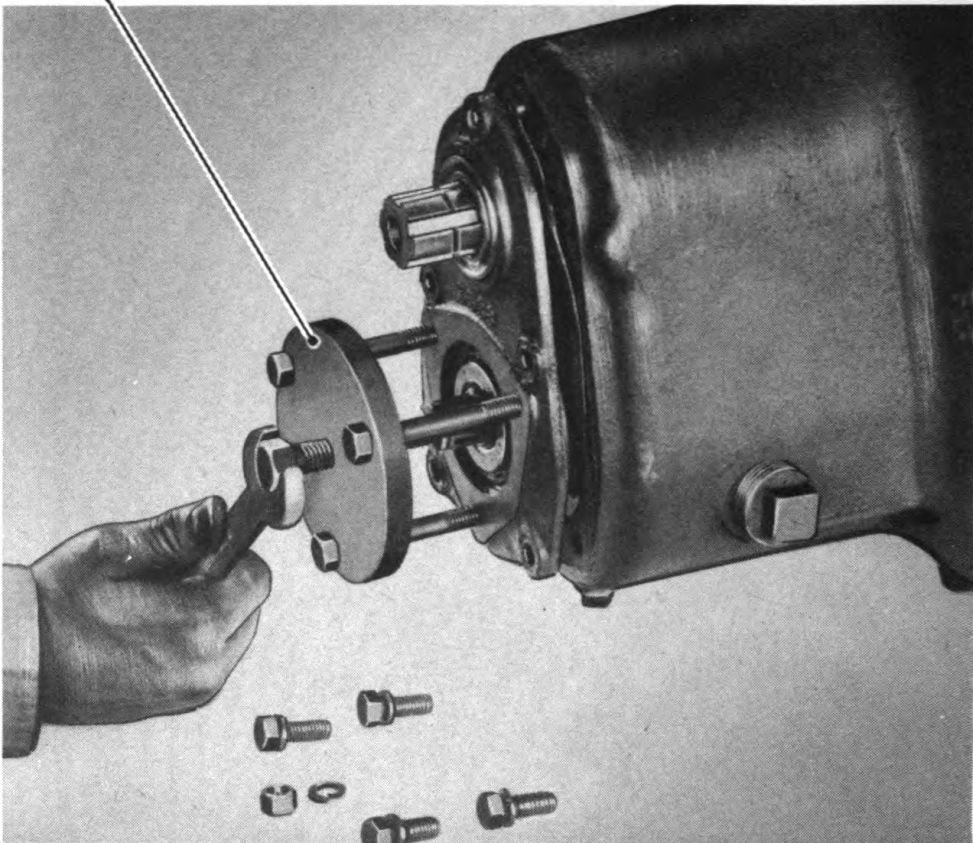


RA PD 49458

Figure 49—Cutting Pinion Low Speed Gear Snap Ring for Removal

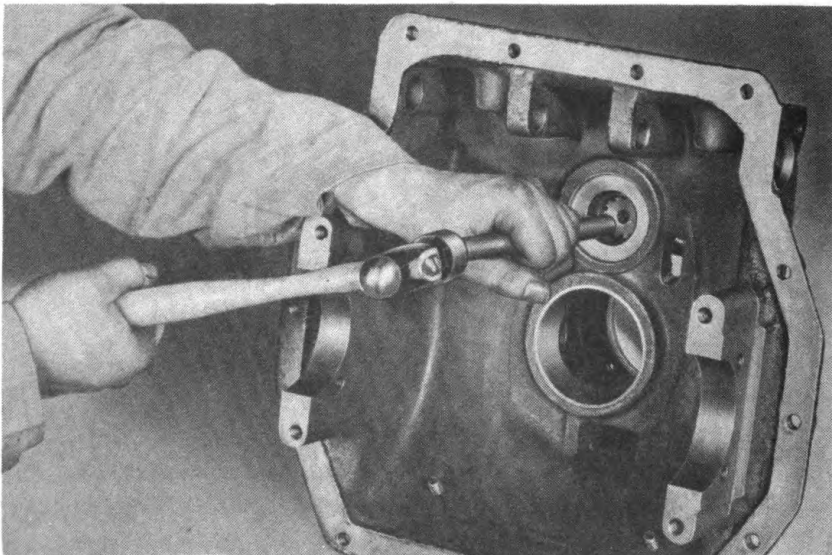
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TRANSMISSION COVER PLATE AND
PINION OUTER BEARING REMOVER KM-J3640



RA PD 67133

**Figure 50—Axle Transmission Front Cover Plate and
Pinion Front Bearing Removal**



RA PD 67164

Figure 51—Method of Removing Axle Transmission Mainshaft

**DISASSEMBLY OF AXLE DIFFERENTIAL
AND TRANSMISSION**

h. Remove Axle Transmission Mainshaft, Bearings and Gears. Drive mainshaft and front bearing out from front of the case with brass drift and hammer (fig. 51). Lift mainshaft high-speed gear, spacer, low-speed gear, and rear bearing cone out of the case.

Section XIII

**CLEANING OF AXLE DIFFERENTIAL AND
TRANSMISSION COMPONENTS**

	Paragraph
Cleaning	62

62. CLEANING.

a. Clean all parts and subassemblies with SOLVENT, dry-cleaning, and dry with wiping cloths or compressed air. Allow the bearing cones to soak thoroughly in the solvent, long enough to loosen hard or dry lubricant. Then strike the bearing cones sharply on a block of wood to dislodge any particles. Again immerse the cones and wash thoroughly. Blow the cones dry with compressed air, being careful not to direct the air against the side or face of the cone to avoid spinning.

Section XIV

DISASSEMBLY OF AXLE DIFFERENTIAL

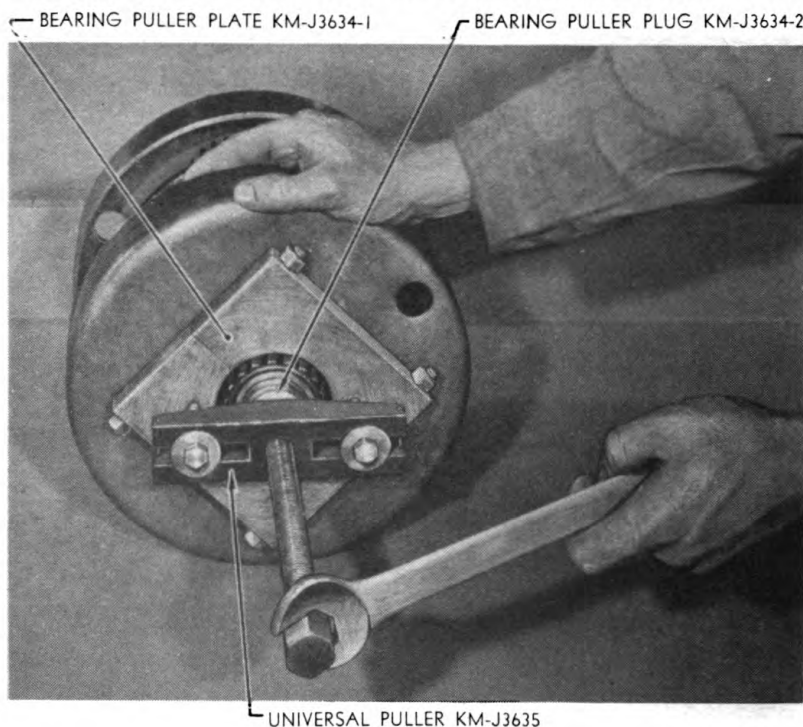
	Paragraph
Disassembly	63

63. DISASSEMBLY.

a. Remove Steering Brake Drums. Remove the differential side bearing cones, using puller plate KM-J3634-1, plug KM-J-3634-2, and universal puller KM-J3635 (fig. 52). Lift the steering brake drum with gear off the differential left housing hub (fig. 53). Repeat the procedure to remove drum with gear from differential right housing hub.

b. Remove Right Differential Housing with Bevel Drive Gear, Planet Gears and Pinions from Center Member. Remove lock wires from cap screws that secure right differential housing to center member. Loosen remaining three cap screws about $\frac{1}{4}$ inch at a time, and after blocking under bevel drive gear, drive downward on the screw heads, using a brass drift and hammer, to separate right housing from the center of the center member (fig. 54). Lift differential right axle shaft gear out of center member.

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RA PD 49476

Figure 52—Method of Removing Differential Side Bearing Cone

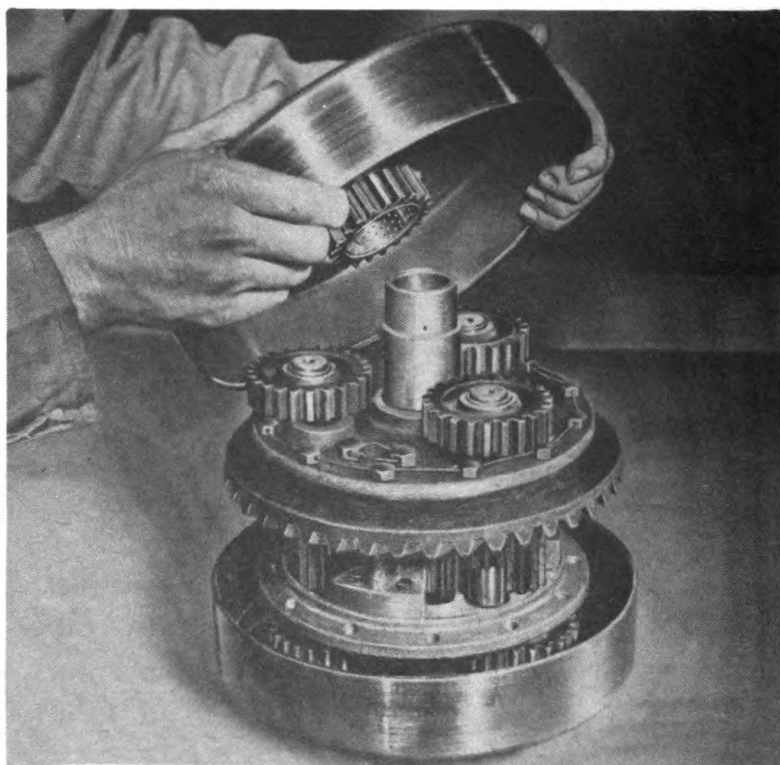
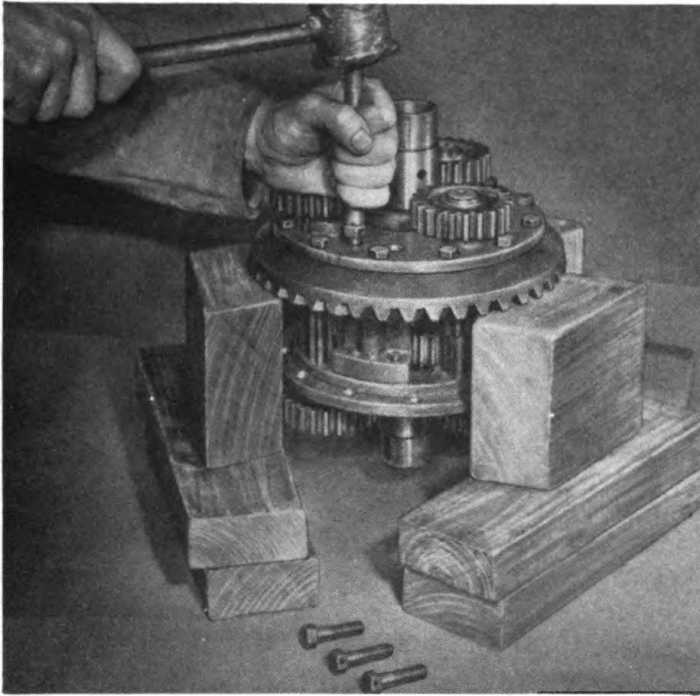


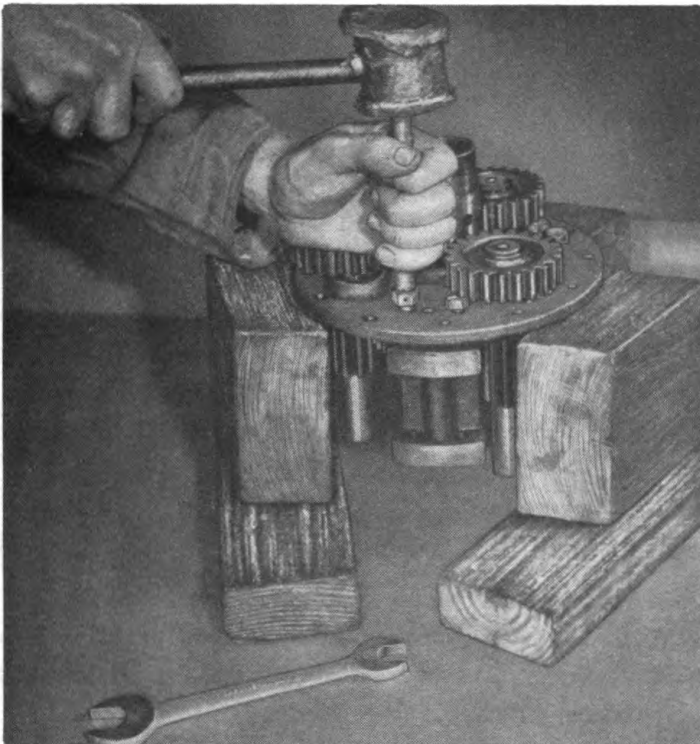
Figure 53—Steering Brake Drum and Gear Assembly Removal

**DISASSEMBLY OF AXLE DIFFERENTIAL
AND TRANSMISSION**



RA PD 66873

**Figure 54—Method of Removing Right Differential Housing
with Bevel Drive Gear, Planet Gears, and Pinions**



RA PD 66874

**Figure 55—Removing Left Differential Housing and
Parts from Center Member**

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c. **Remove Left Differential Housing with Planet Gears and Pinions from Center Member.** Remove lock wires from six cap screws that hold left differential housing to the center member. Block under the housing flange and loosen six cap screws about $\frac{1}{4}$ inch at a time. Drive downward on the screw heads, using a brass drift and hammer, to separate left housing from center member (fig. 55). Remove the three cap screws that are free, and lift left housing off center member. Lift differential left axle shaft gear out of center member.

Section XV

**AXLE DIFFERENTIAL COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**

	Paragraph
General.....	64
Steering brake bands.....	65
Steering brake drums.....	66
Left differential housing, planet gears and pinions, and bushings..	67
Right differential housing, planet gears and pinions, bushings, and bevel drive gear.....	68
Differential side bearings and caps, center member, axle shaft gears, and axle housing.....	69

64. GENERAL.

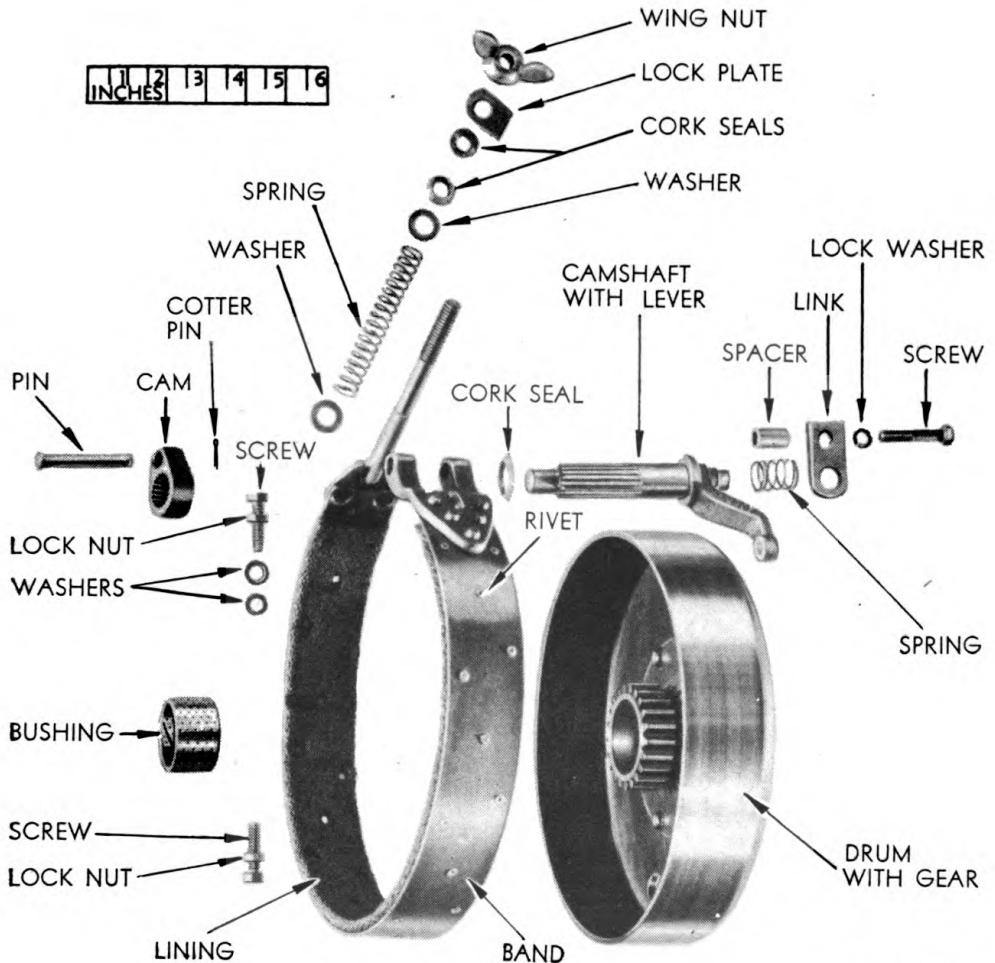
a. The disassembly, cleaning, inspection, repair, and reassembly of the various subassemblies must be performed with care and cleanliness. To avoid confusion or error, each subassembly must be treated as a unit. Mark certain related parts before they are disassembled to aid in subsequent assembly operations. Carefully clean each component after disassembly. The various parts must be inspected carefully and thoroughly to determine their fitness for further service.

65. STEERING BRAKE BANDS.

a. **Disassemble.** Lift the cork oil seals, flat washers, coil springs, and flat washers off the band adjusting studs that are riveted to bands. Remove steering brake cam lock pin cotters and lock pins so the cams are free from cam yokes riveted to the bands (fig. 56).

b. **Inspection.** Clean all metal parts in SOLVENT, dry-cleaning. Examine the coil springs for breakage. Inspect the cams and cam lever shafts for burred or chipped splines, or other damage. Examine the bands,

**AXLE DIFFERENTIAL COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**



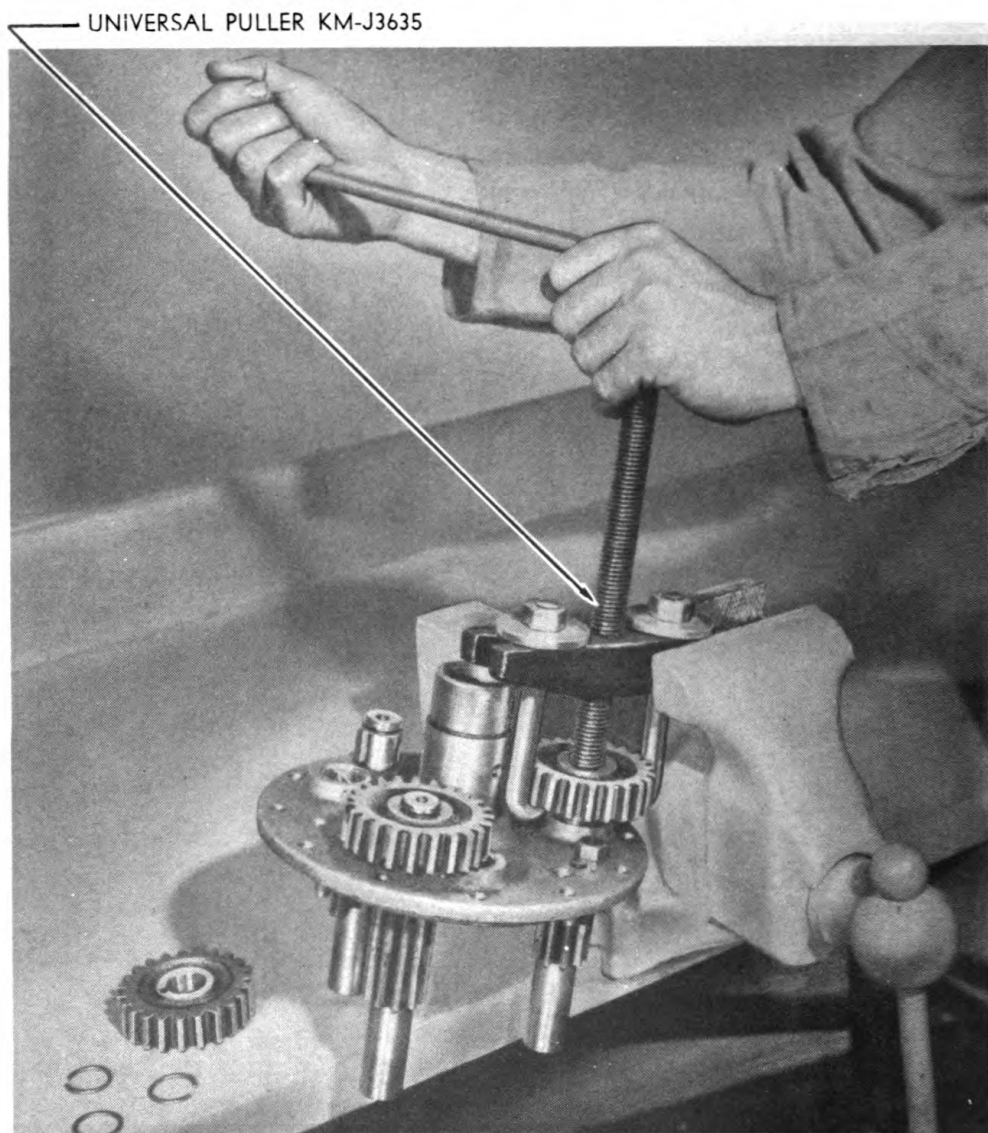
RA PD 67170

Figure 56—Parts of the Differential Steering Brake

yokes and studs for breakage or other damage. Examine the band linings for wear or damage. Notice whether the heads of the rivets securing the linings to the bands are flush or nearly flush with the drum contacting surface of the linings. Inspect the steering brake levers for breakage and the adjustable linkage for stripped threads.

c. Repair. If the coil springs are broken, install new springs during reassembly. Install new cams and lever shafts if damaged splines are found. Install new cork seals during reassembly on the band studs and cam lever shafts. If the bands with riveted studs and yokes are in any way damaged so they cannot be repaired by reriveting or by cleaning the stud threads, replace the bands. If the band linings are worn flush or nearly flush with the rivet heads that secure the linings to the bands, install new linings. To do this, remove the rivets by driving them out of the bands. Replace the steering brake levers if broken and the adjustable linkage if threads are stripped.

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RA PD 66875

Figure 57—Method of Removing Planet Gears

d. **Assemble.** Install steering brake cams, lock pins, and new cotter pins (fig. 56). On each band stud, install flat washers, a coil spring, and a new cork seal.

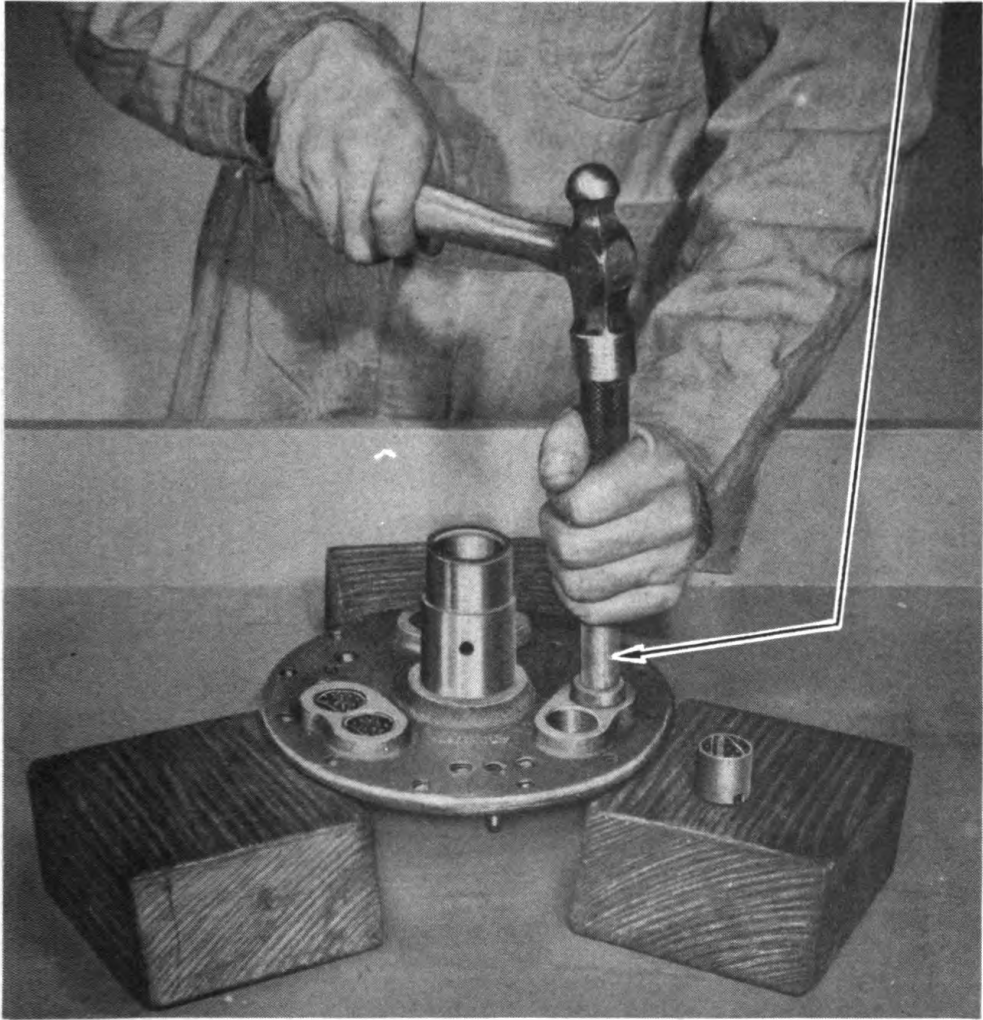
66. STEERING BRAKE DRUMS.

a. **Disassemble.** Disassembly of the steering brake drum is not advisable.

b. **Inspection.** Clean drum assemblies in SOLVENT, dry-cleaning. Inspect lining contact surface of the drums for grooves, roughness and dis-

**AXLE DIFFERENTIAL COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**

REMOVER AND REPLACER KM-J3637



RA PD 66877

Figure 58—Removing Planet Pinion Bushings

tortion. Examine the gear and bushing in each drum for looseness or damage.

c. **Repair.** If drums are distorted or the lining contacting surfaces are badly grooved, replace the drums. However, in the event that the lining contacting surfaces are merely rough, they can be made serviceable by polishing with aluminum oxide cloth. If gear teeth are broken, or gear flanges loose, replace the drum assemblies. If bushings are loose or damaged, replace the drum assemblies.

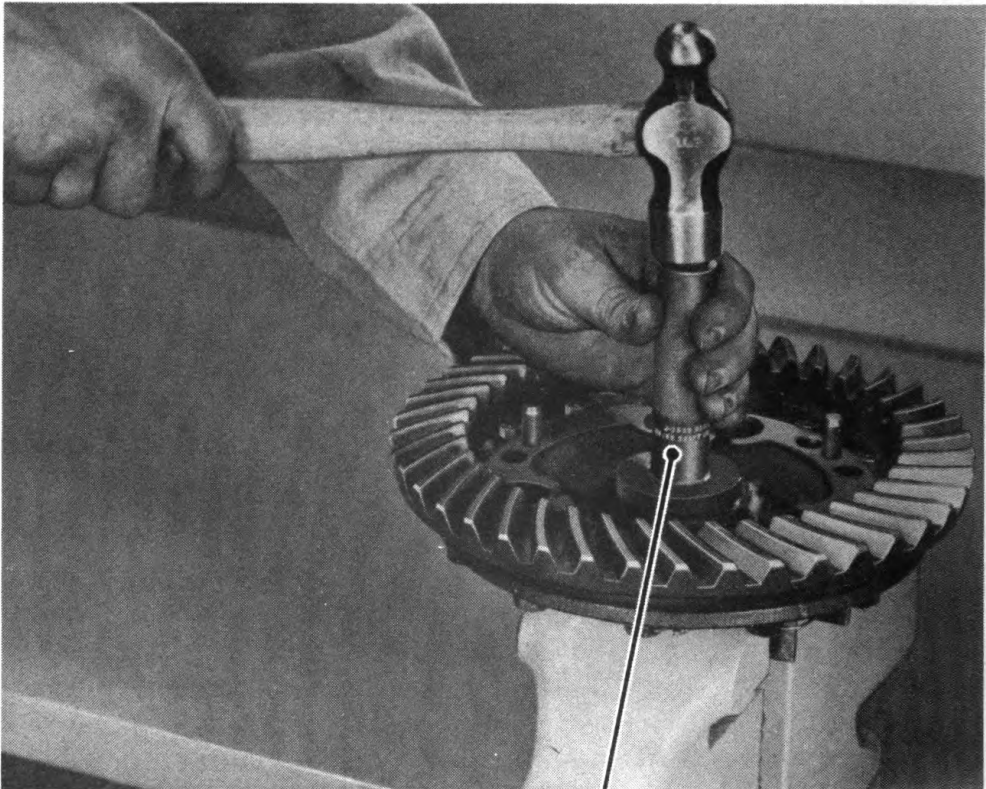
67. LEFT DIFFERENTIAL HOUSING, PLANET GEARS AND PINIONS, AND BUSHINGS.

a. **Disassemble.** Remove planet gear snap rings with snap ring pliers and a screwdriver from outer ends of planet pinions. Pull each planet gear

**ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
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from its planet pinion, using puller KM-J3635 with jaws (fig. 57). Remove Woodruff keys from keyways and slide pinions out of housing after marking the housing to indicate from which bore each pinion was removed.

b. Inspection. Clean all parts in SOLVENT, dry-cleaning. Examine the housing for cracks, scores or other damage. Inspect the planet gears and pinions for nicked or broken teeth or other damage. Inspect the planet pinion bushings and the differential axle shaft gear bushing for looseness or damage.



FINAL DRIVE GEAR BUSHING REPLACER KM-J3639

RA PD 67160

Figure 59—Installing Final Drive Shaft Gear Bushing

c. Repair. If the housing or hub is damaged or broken, replace it. Replace any planet gears having damaged teeth. If the bushing contacting surfaces on the planet pinions are damaged and cannot be restored by smoothing with aluminum oxide cloth, or if the pinion teeth are broken, replace the pinions. Damaged Woodruff keys must not be used on re-assembly, and new planet gear snap rings must be installed. Replace any planet pinion bushings found to be unsatisfactory for further service, using bushing remover and replacer KM-J3637 and a hammer (fig. 58). If necessary, remove the differential axle shaft gear bushing from the inner hub of the housing (using a cape chisel and a hammer to collapse the bushing

AXLE DIFFERENTIAL COMPONENTS DISASSEMBLY, INSPECTION, REPAIR, AND ASSEMBLY

at the split) and remove it from the hub bore. Install a new axle shaft gear bushing in the inner hub of the housing with bushing replacer KM-J3639 (fig. 59). Dowel pins must be replaced if they are loose or broken.

d. **Assemble.** Install one of the planet pinions in the proper bore so that the end with keyway and snap ring groove extends outside of the dif-

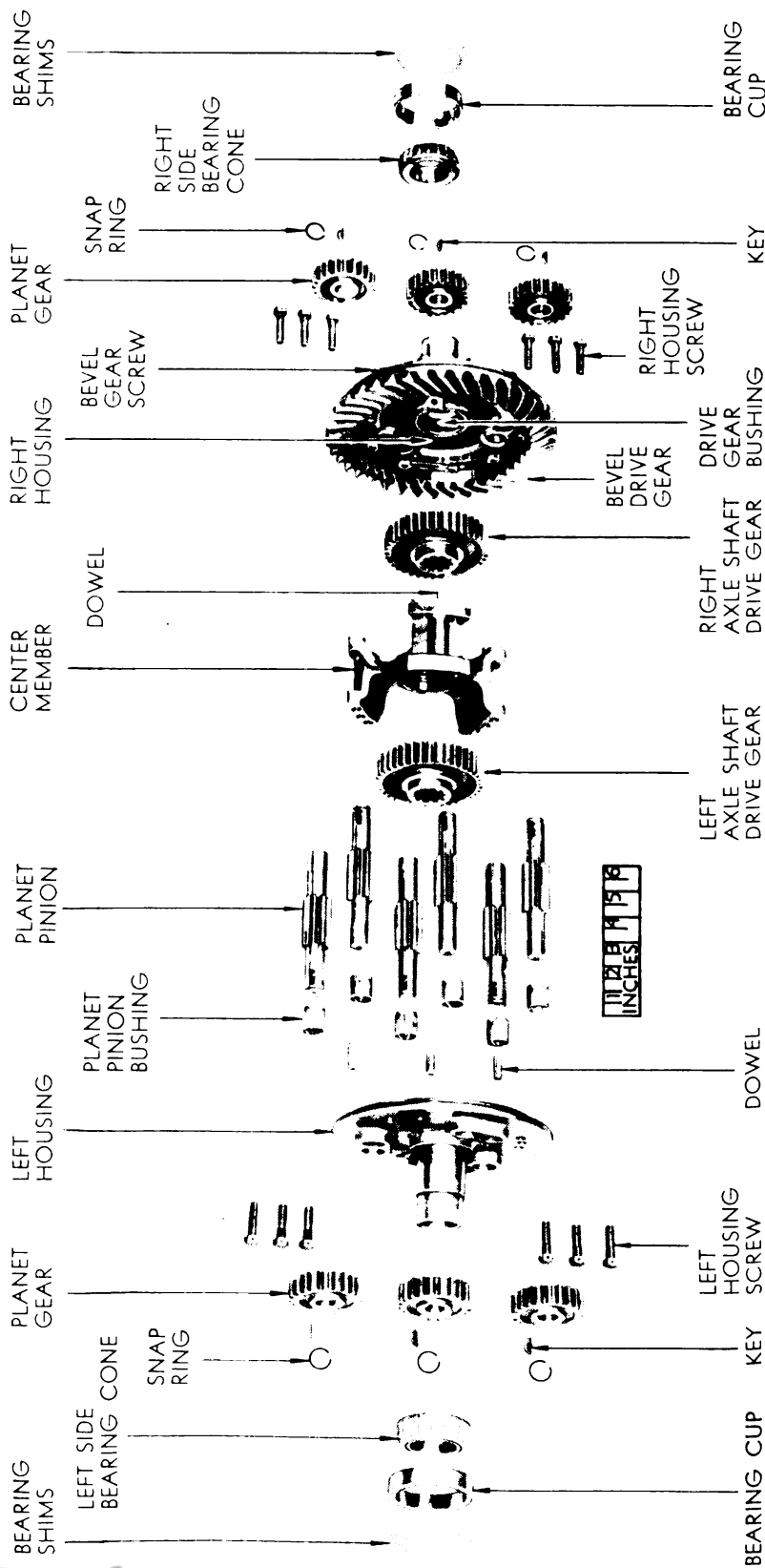


RA PD 49474

Figure 60—Method of Installing Planet Gears on Pinions

ferential housing. Place a Woodruff key in the keyway of pinion, and insert a cap screw into hole in housing adjacent to pinion before installing planet gear. Place a planet gear on the end of the pinion (with the hub extension toward the housing), alining keyway in planet gear with Woodruff key in pinion (fig. 60). Place a 0.010-inch feeler between the gear hub and the housing to assure proper clearance. Press gear on pinion shaft until

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RA PD 66973

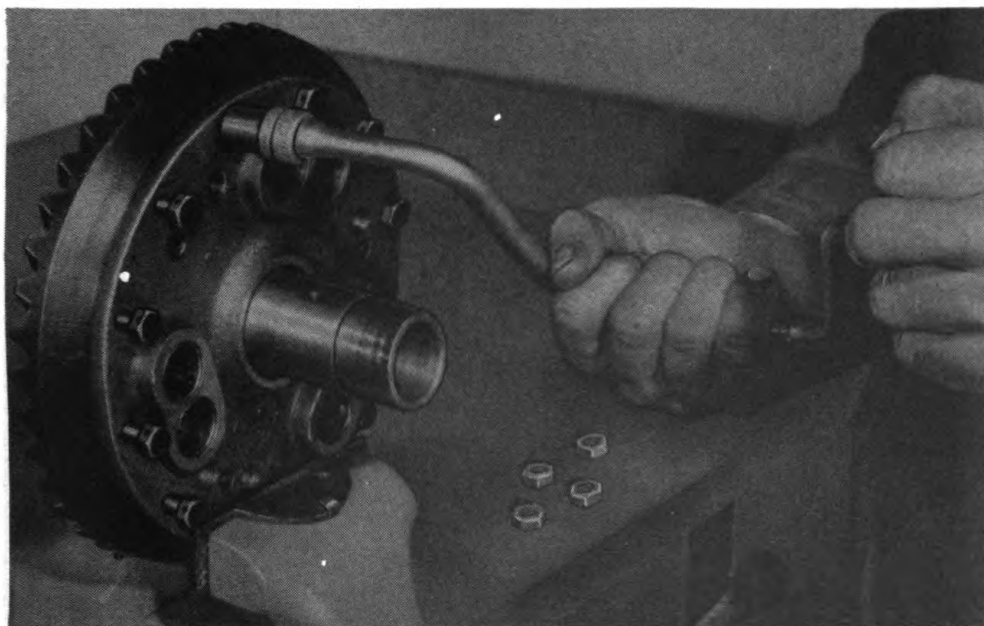
Figure 61—Differential Parts

AXLE DIFFERENTIAL COMPONENTS DISASSEMBLY, INSPECTION, REPAIR, AND ASSEMBLY

planet gear snap ring can be installed in snap ring groove with snap ring pliers. Repeat the procedure to install the other two planet pinions and gears.

68. RIGHT DIFFERENTIAL HOUSING, PLANET GEARS, AND PINIONS, BUSHINGS, AND BEVEL DRIVE GEAR.

a. **Disassemble** (fig. 61). Remove planet gear snap rings from the outer ends of the planet pinions with snap ring pliers and a screwdriver. Pull each planet gear from its planet pinion, using puller KM-J3635 with jaws. Remove Woodruff keys from keyways, and slide pinions out of



RA PD 66970

Figure 62—Bevel Drive Gear Removal

housing, after marking housing to indicate the bore from which each pinion was removed. Remove locking wire from heads of the bevel drive gear bolts that secure bevel drive gear to housing; remove bolts and nuts (fig. 62) and tap on outer portion of gear if necessary with a copper hammer.

b. **Inspection.** Clean all parts in SOLVENT, dry-cleaning. Examine the housing for cracks, scores or other damage. Inspect planet gears and pinions for chipped or broken teeth or other damage. Inspect the six planet pinion bushings and the differential axle shaft gear bushing for looseness or damage. Examine bevel drive gear for breakage, proper tooth bearing, galled teeth or other damage.

c. **Repair.** If the housing or hub is damaged or broken, replace it. Replace the planet gears if teeth are chipped or damaged. If the bushing contacting surfaces on the planet pinions are damaged and cannot be re-

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stored by smoothing with aluminum oxide cloth, or if the pinion teeth are broken, replace the pinions. Damaged Woodruff keys must not be used on reassembly, and new planet gear snap rings must be installed. Replace any planet pinion bushings found to be unsatisfactory for further service, using bushing remover and replacer set KM-J3637, and a hammer. If necessary, remove the differential axle shaft gear bushing from the inner hub of the housing (using a cape chisel and hammer to collapse the bushing at the split) and remove it from the hub bore. Install a new axle shaft gear bushing in the inner hub of the housing with bushing replacer KM-J3639. If the bevel drive gear is unfit for further service, replace it. Replace the dowel pins if they are loose or broken.

d. **Assemble.** Make sure that the mating surfaces of the bevel drive gear and housing are free from burs, grit, or other foreign matter. Place gear on housing so that bolt holes in gear are alined with holes in housing. If necessary, tap gear until it is seated properly on the housing, using a rawhide mallet. Install bolts and nuts and tighten them alternately and progressively until secure. Lock the bolts with locking wire. Install one of the planet pinions in the proper bore so that the end with the keyway and snap ring groove extends outside of the differential housing. Install a Woodruff key in the keyway of the pinion. Place a planet gear on the end of the pinion (with the hub extension toward the housing) so that the keyway in the planet gear is alined with the Woodruff key in the pinion. Place a 0.010-inch feeler between the gear hub and the housing to assure proper clearance. Press the gear on the pinion shaft until the planet snap ring can be installed in the snap ring groove with snap ring pliers. Repeat the procedure to install the other two planet pinions and gears.

69. DIFFERENTIAL SIDE BEARINGS AND CAPS, CENTER MEMBER, AXLE SHAFT GEARS, AND AXLE HOUSING.

a. **Inspection.** Examine the bearing cones for scored or damaged rollers and excessive looseness of the roller retainers. Check the bearing cups for scores or damage. Inspect the bearing caps for breakage or other damage. Examine the center member for cracks or other damage and the screw holes for stripped threads. Inspect the axle shaft gears for scores or burs on the machined surfaces, and for chipped or damaged teeth. Inspect the axle housing for breakage or other damage.

b. **Repair.** If the bearing cones or cups are found to be unfit for further service, replace them. Replace the bearing caps if they are broken or otherwise damaged. If the center member or axle shaft gears are unsatisfactory for further service, replace them. If the axle housing is broken or damaged and cannot be made serviceable by welding or machining, replace it.

Section XVI

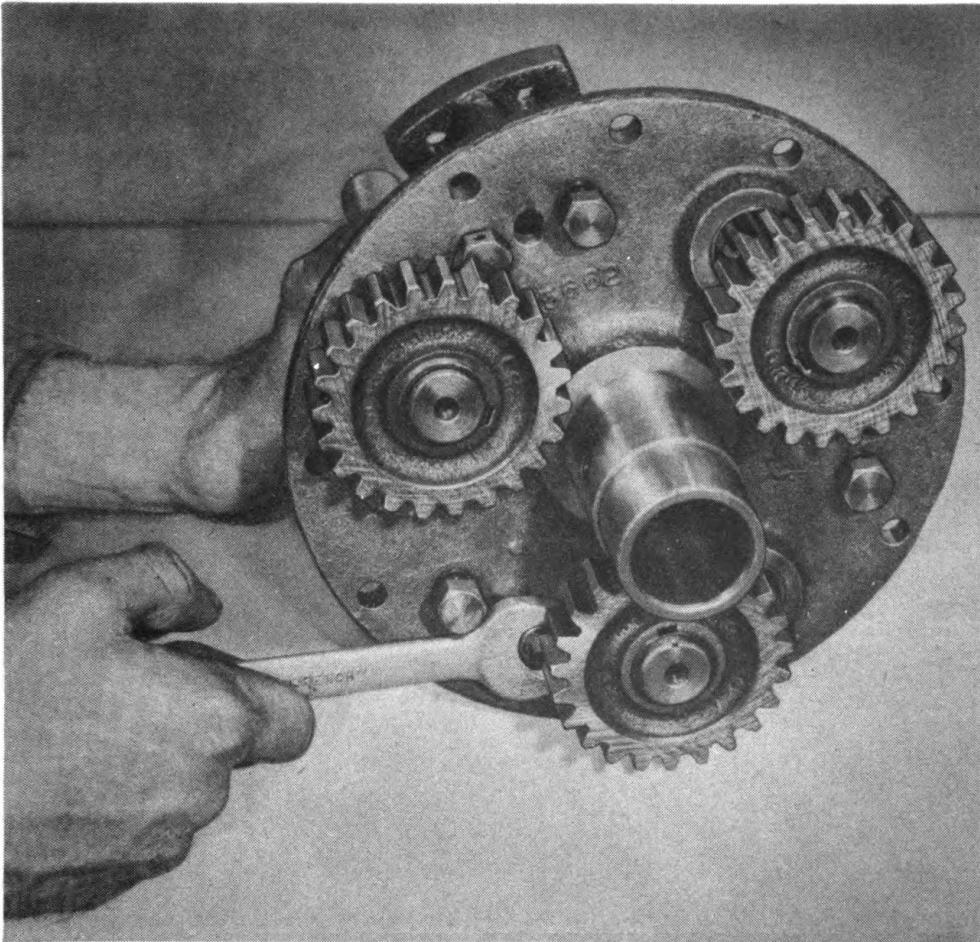
ASSEMBLY OF AXLE DIFFERENTIAL

Paragraph

Assembly 70

70. ASSEMBLY.

a. **Install Left Differential Housing with Planet Gears and Pinions, and Left Axle Shaft Gear on Center Member.** Set the center member on a bench with three of the drilled sectors up, and place left axle shaft

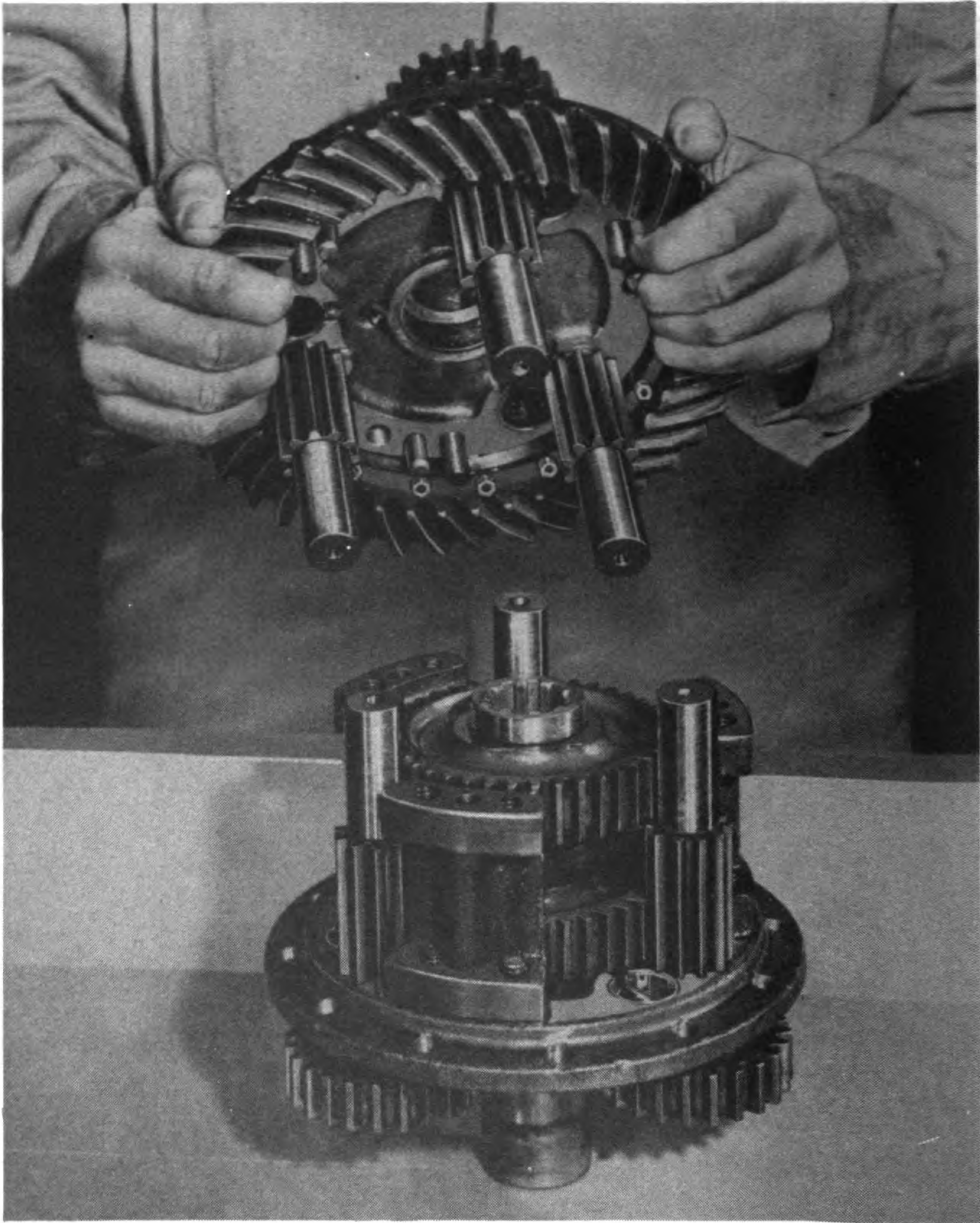


RA PD 66876

Figure 63—Assembling Left Housing with Planet Gears and Pinions to Center Member

gear into position in the hub of center member. With hub or left differential housing assembly up, turn planet gears so that the keyways all point toward center of hub (fig. 63). The keyways must be alined in this manner, otherwise the differential will lock, due to the difference in tooth pitch on the various meshing gears if they are not in proper engagement with each other. Lift the differential housing assembly and set it over the center

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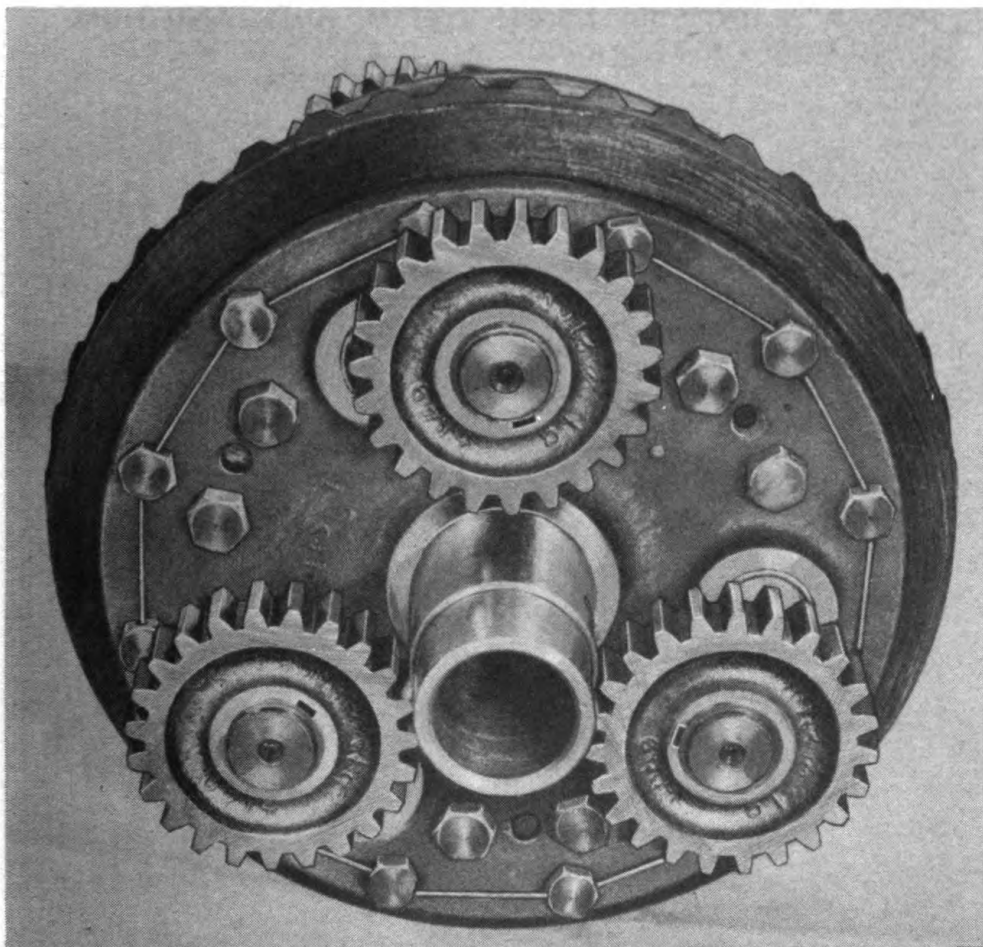


RA PD 66990

**Figure 64—Assembling Right Housing with Parts to
Center Member and Left Housing**

member, so that the cap screw holes in the housing are alined with the mating holes in the center member, and the pinion teeth mesh with the teeth on the left axle shaft gear. Install remaining cap screws and tighten all cap screws alternately and progressively (starting with the screws under the planet gears). Tap on the housing over the dowels only as required with a brass drift and a hammer, to assist in seating the left housing

ASSEMBLY OF AXLE DIFFERENTIAL



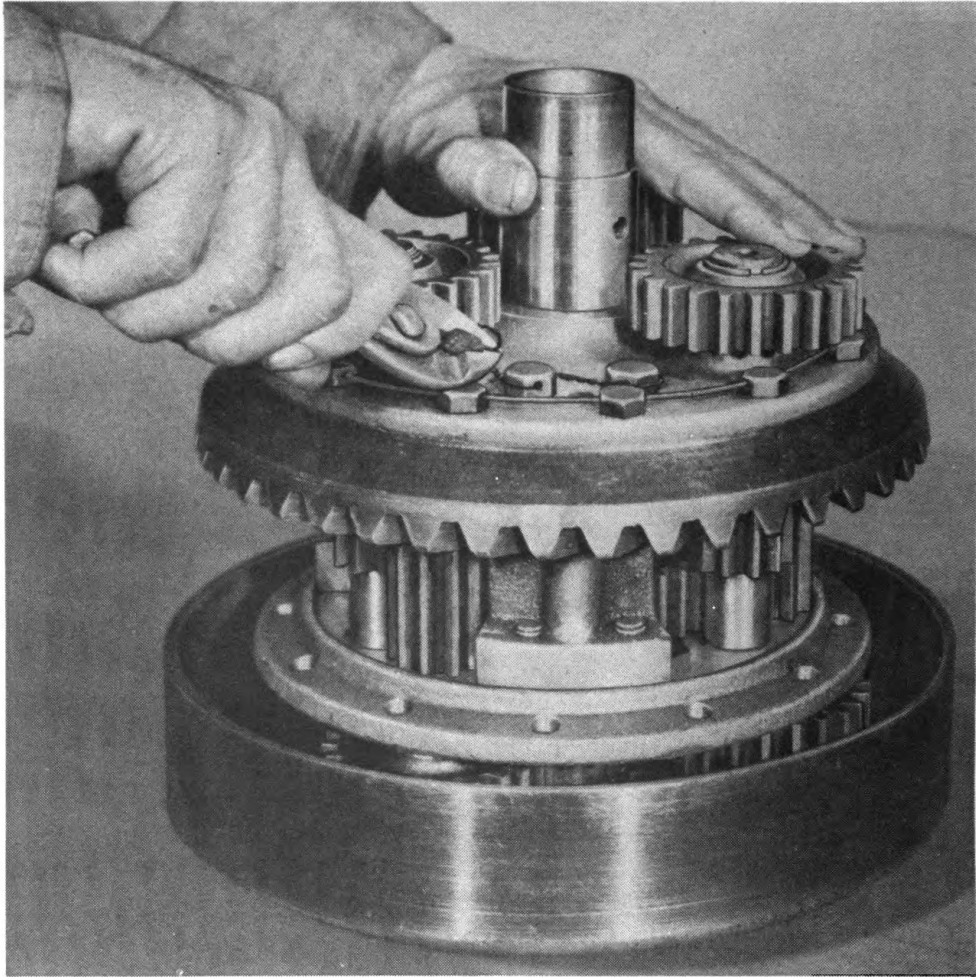
RA PD 49462

Figure 65—Right Housing with Parts Assembled to Center Member and Left Housing

with dowels against the center member. Tighten cap screws securely and lock each pair with locking wire.

b. Install Right Differential Housing with Bevel Drive Gear, Planet Gears and Pinions, and Right Axle Shaft Gear on Center Member. Place left differential housing assembly with center member on the bench so that it sets on the housing hub. *Make sure the keyways in the planet gears on the left housing still point to the center of the hub.* Place right axle shaft gear in position in hub of center member. With hub of the right differential housing assembly up, turn planet gears so that keyways all point toward hub center. This is important because the differential will lock if the various meshing gears which have differences in gear tooth pitch are not in proper engagement. Lift the right differential housing assembly and set it over the center member (fig. 64) so cap screws in housing are aligned with mating holes in center member (fig. 65). Turn the three planet gears in the right housing slightly as required in the same direction, in order that planet pinions will mesh with right axle shaft gear and planet pinions

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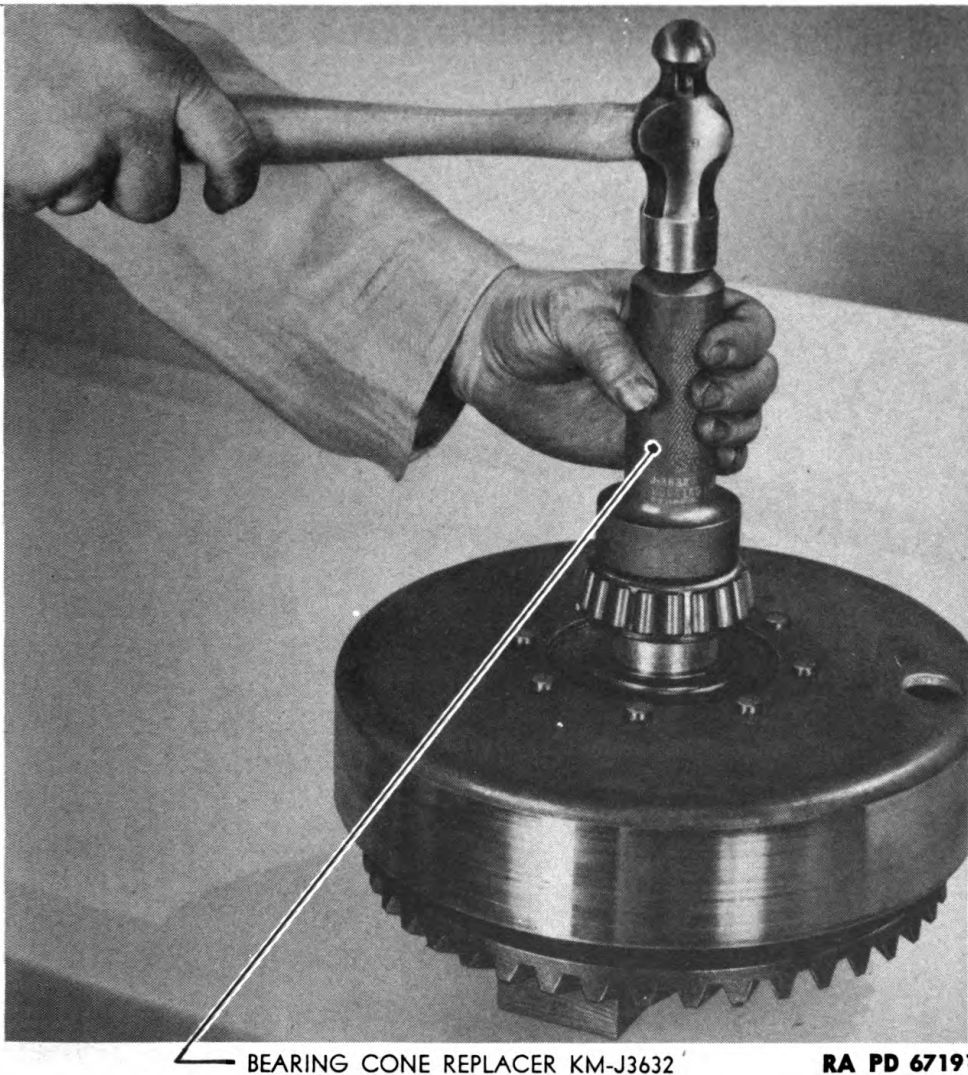
RA PD 49461

Figure 66—Lock Wire Installation

in the left housing. Install and tighten the cap screws in right housing. Tap on the housing over the dowels only as required with a brass drift and hammer to assist in seating the right housing with dowels against the center member. Turn planet gears by hand to make certain all gears operate freely, and that the differential does not lock. Tighten cap screws securely and lock each pair with locking wire (fig. 66).

c. **Install Steering Brake Drums.** With keyways in all planet gears pointing to the center of the hubs, set one drum with gear in place over left housing hub. Repeat procedure to install the other drum with gear. Using bearing cone replacer KM-J3632, drive one of the differential side bearing cones into position on right housing hub with numbered side toward housing (fig. 67). Repeat procedure to install the other bearing cone on the left housing hub.

ASSEMBLY OF AXLE DIFFERENTIAL



BEARING CONE REPLACER KM-J3632

RA PD 67191

Figure 67—Differential Side Bearing Cone Installation

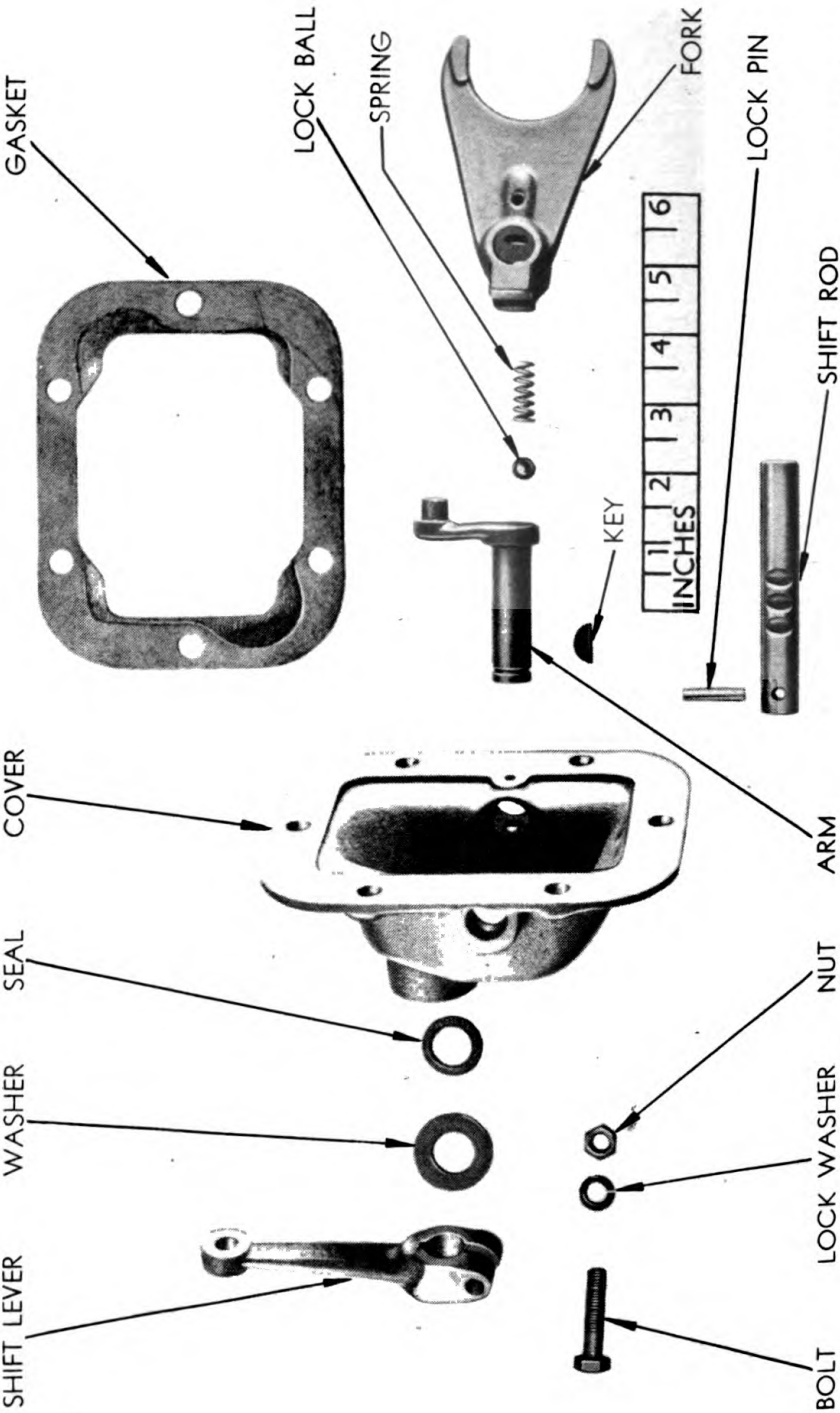
d. **Install Steering Brake Bands.** With bevel drive gear on the right side, place brake bands over drums so that the adjusting studs extend upward.

Section XVII

AXLE TRANSMISSION COMPONENTS DISASSEMBLY, INSPECTION, REPAIR, AND ASSEMBLY

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Pinion, bearings, and gears.....	74
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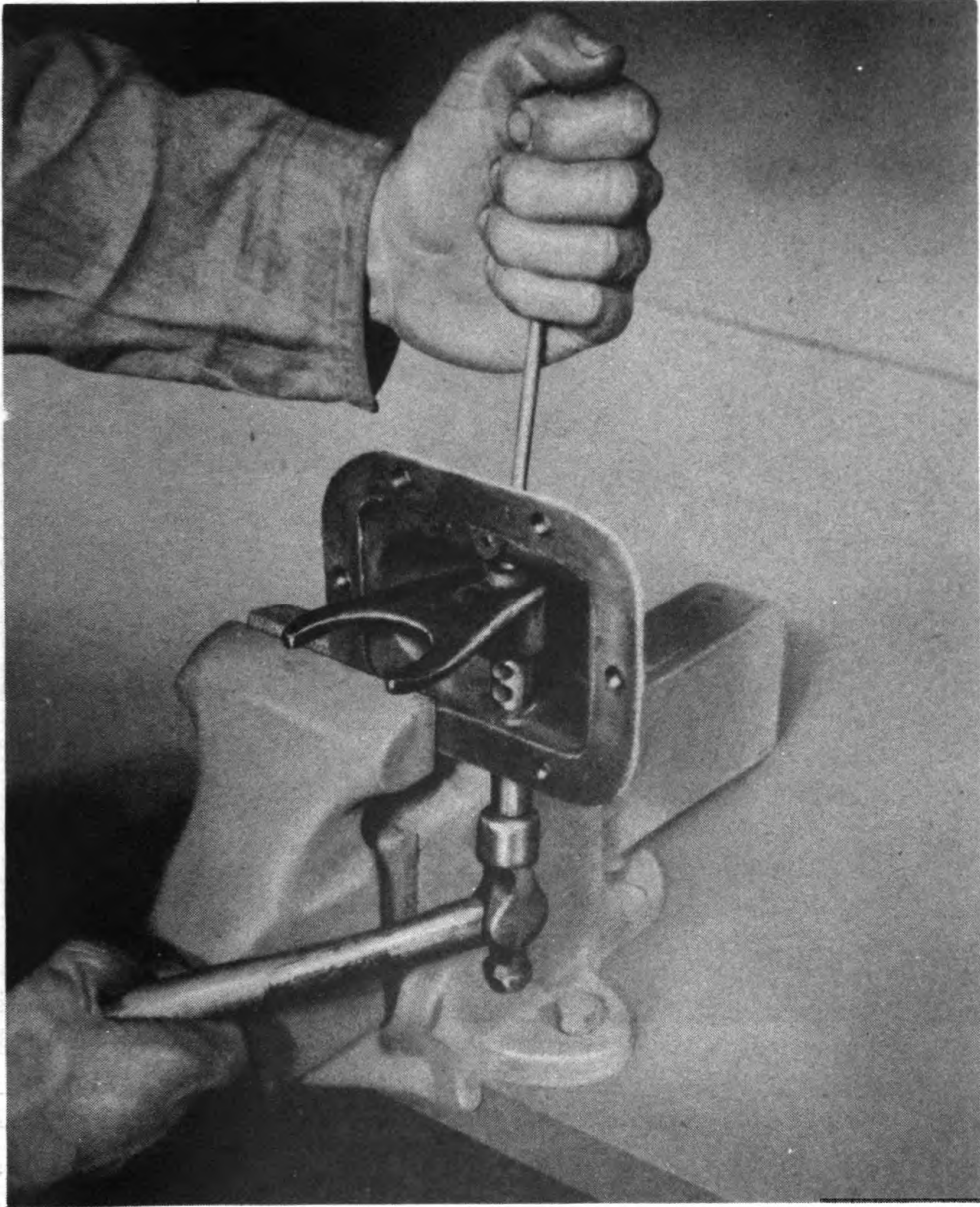
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RA PD 67156

Figure 68—Axle Transmission Gearshift Mechanism

**AXLE TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**



RA PD 66975

Figure 69—Shift Rod Installation in Cover and Shift Fork

71. GENERAL.

a. The disassembly, cleaning, inspection, repair, and reassembly of the various subassemblies must be performed with care and cleanliness. To avoid confusion or error, each subassembly must be treated as a unit. Mark certain related parts before disassembly to aid in subsequent assembly operations. Carefully clean each component after disassembly. The various parts must be inspected carefully and thoroughly to determine their fitness for further service.

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RA PD 49455

**Figure 70—Removing Pinion Low Speed Gear Bearing
Sleeve and Thrust Washer**

72. SHIFT COVER ASSEMBLY.

a. **Disassemble** (fig. 68). Drive out the lock pin that secures the rear end of shift rod to the shift cover. Drive shift rod out front bore in cover with a brass drift and hammer, being careful not to lose shift rod lock ball released from the recess in the shift fork. Remove shift lever lock bolt with nut and lock washer. Drive against the outer end of shift arm shaft while holding shift lever to remove lever from arm shaft, using a brass drift and hammer. Remove Woodruff key from the end of shift arm shaft, and pull arm out of cover.

b. **Inspection.** Clean all parts in SOLVENT, dry-cleaning. Inspect the shift rod and ball notches for burrs or evidence of damage. Check the shift arm for alinement or damage. Inspect the shift fork sliding gear con-

**AXLE TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**



PINION INNER BEARING CUP REMOVER KM-J3628

RA PD 67173

Figure 71—Pinion Rear Bearing Cup Removal

tacting surfaces and the shift rod bearing surface for burs, scores and alinement of the shift fork. Check ball tension spring for damage. Examine shift rod lock ball for scores or damage. Examine shift cover bores for scores or other damage.

c. Repair. Where possible, remove any burs or rough places on the part. Replace any parts which cannot be made serviceable. Use a new cork oil seal on reassembling to minimize the possibility of leakage at this point.

d. Assemble. Place the cover (with shift rod lock pin hole at the bottom) in a vise with copper jaws or other soft metal inserts, and install shift arm in cover. Insert ball tension spring in recess in shift fork. Hold shift fork with hub extension up, so the rod bore in fork is in alinement with shift rod bore in cover, and engage the fork with the shift arm lug. Start the undrilled portion of shift rod up through cover lower bore with ball notches toward spring recess and through fork bore. Place lock ball into

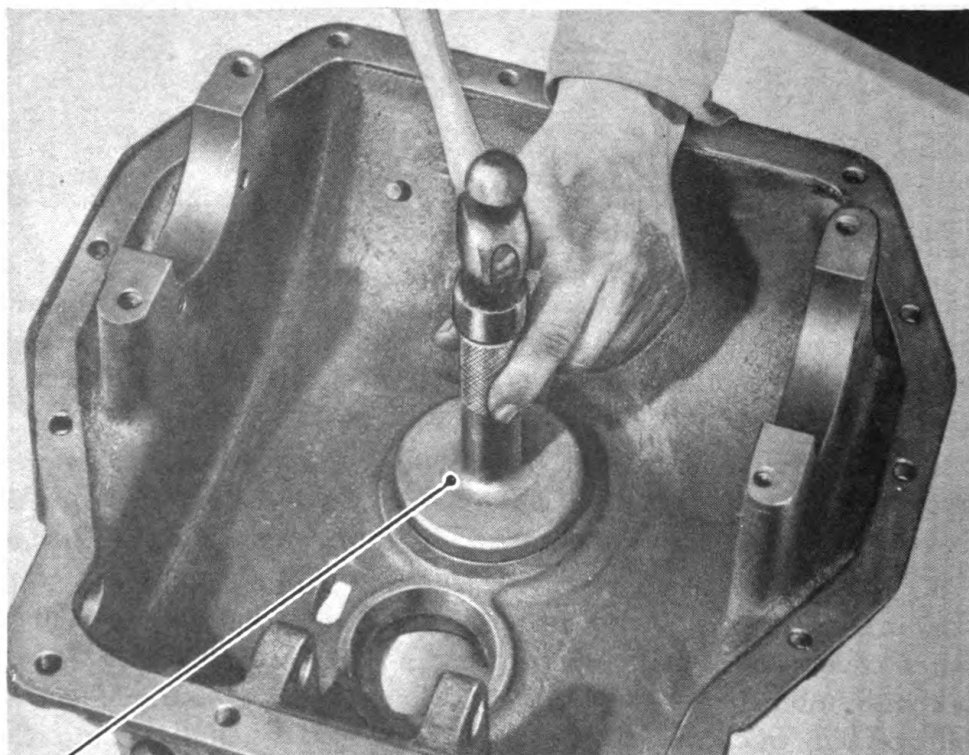
**ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**



PINION OUTER BEARING CUP REMOVER KM-J3630

RA PD 67145

Figure 72—Removing Pinion Front Bearing Cup

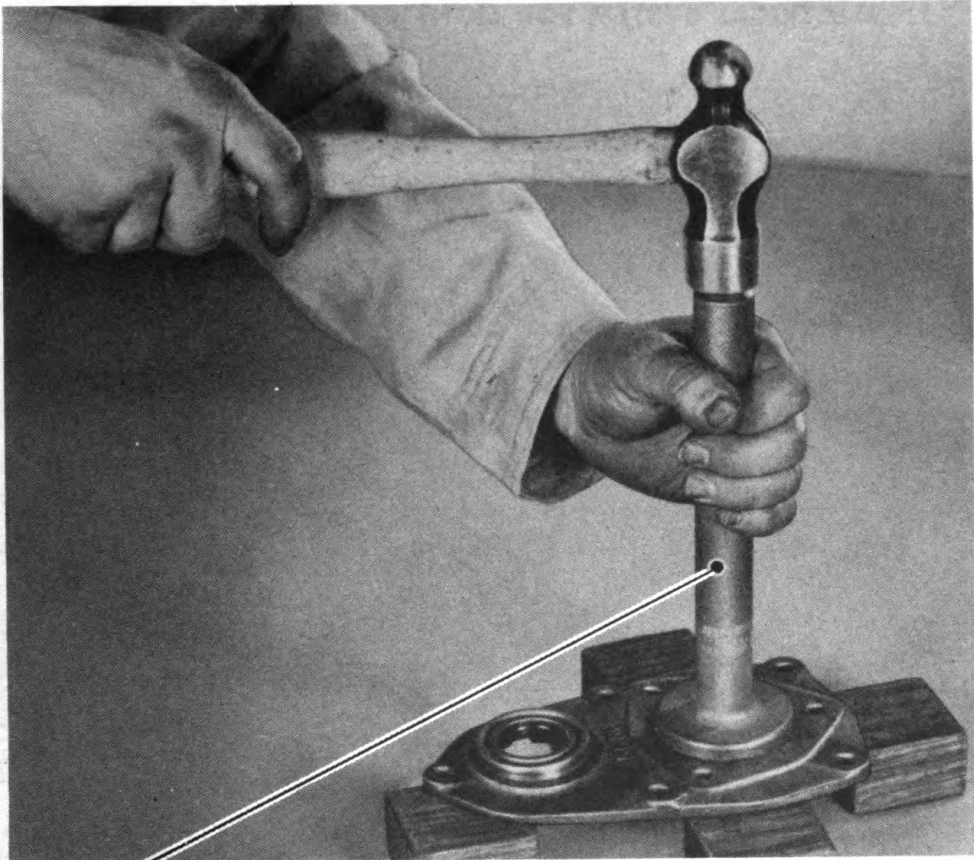


PINION INNER BEARING CUP REPLACER KM-J3627

RA PD 67159

Figure 73—Installing Pinion Rear Bearing Cup

**AXLE TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**



— PINION OUTER BEARING CUP REPLACER KM-J3629

RA PD 67192

Figure 74—Installing Pinion Front Bearing Cup

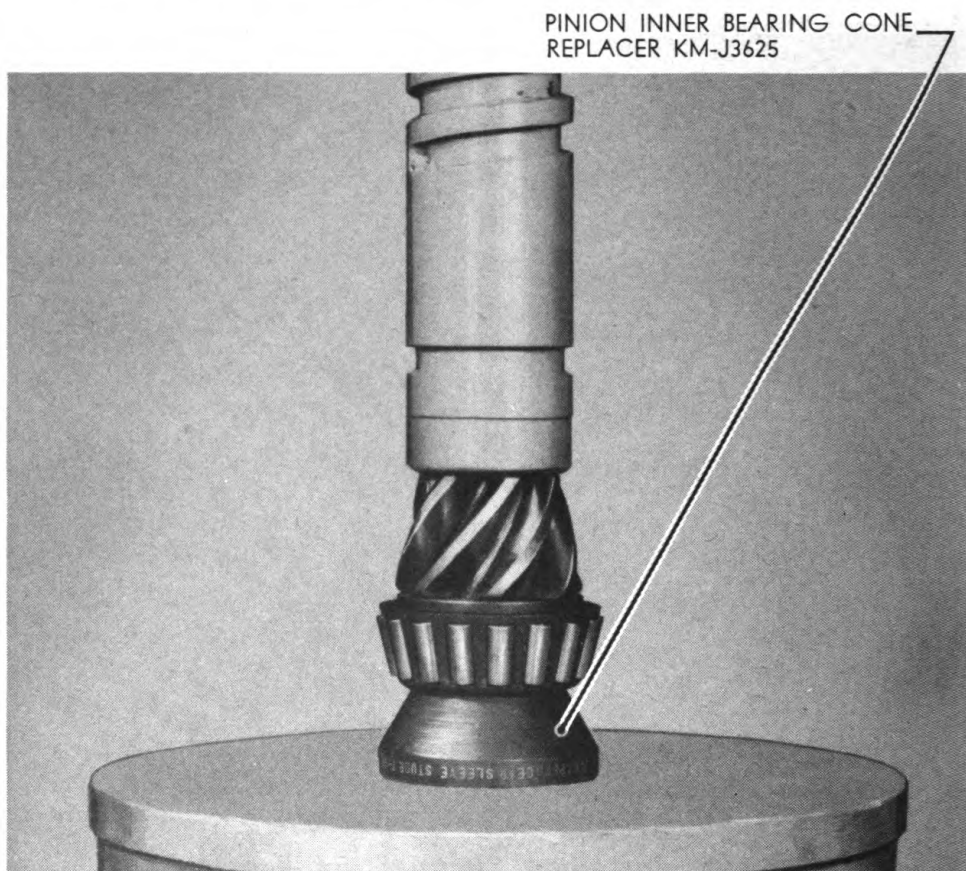
shift fork hub, and with it resting on the end of the shift rod, press the lock ball into spring recess in shift fork, at the same time tapping the lower end of shift rod through fork and into the cover upper bore (fig. 69). Aline shift rod lock pin hole with holes in the cover, and install lock pin and tap into place. Install a new cork oil seal over outer end of shift arm shaft. Install Woodruff key in keyway, and tap shift lever into position on shift arm shaft. (The bend of the shift lever must be toward the cover.) Install shift lever lock bolt, lock washer and nut, and tighten securely.

73. PINION REAR BEARING CAP ASSEMBLY.

a. **Disassemble.** Loosen speedometer pinion sleeve, if not loosened previously, and remove sleeve from axle transmission pinion rear bearing cap. Lift the speedometer pinion out of the cap.

b. **Inspection and Repair.** Clean all parts in SOLVENT, dry-cleaning. Inspect the teeth on the pinion gear for chipping, burs, or other damage. Examine the pinion shaft for scoring or damage. Inspect the pinion pilot bushing within the cap and pinion sleeve nut which supports the other end of the pinion. If any damage cannot be repaired by machining or dressing down burs, replace parts as required.

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RA PD 67134

Figure 75—Pinion Rear Bearing Cone Installation

c. **Assemble.** Install the speedometer pinion in bearing cap so pinion pilot enters the pilot bushing. Install pinion sleeve.

74. PINION, BEARINGS, AND GEARS.

a. **Disassemble.** Drive against pinion thrust washer with a brass drift and hammer to remove the pinion low gear bearing sleeve with pin and thrust washer from pinion shaft (fig. 70). Slip low-gear spacer off pinion shaft. Remove pinion rear bearing cone from pinion shaft. If necessary, the pinion rear bearing cup may be removed by driving it forward out of the case, using remover KM-J3628 (fig. 71). If the rear bearing cup snap ring is broken, remove the pieces and install a new snap ring. The pinion front bearing cup may be removed from the axle transmission front cover plate by driving it out the front of the cover plate, using remover KM-J3630 (fig. 72). If the front bearing cup snap ring is broken, remove the pieces and install a new snap ring.

b. **Inspection.** Clean all parts in SOLVENT, dry-cleaning. Examine

AXLE TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY

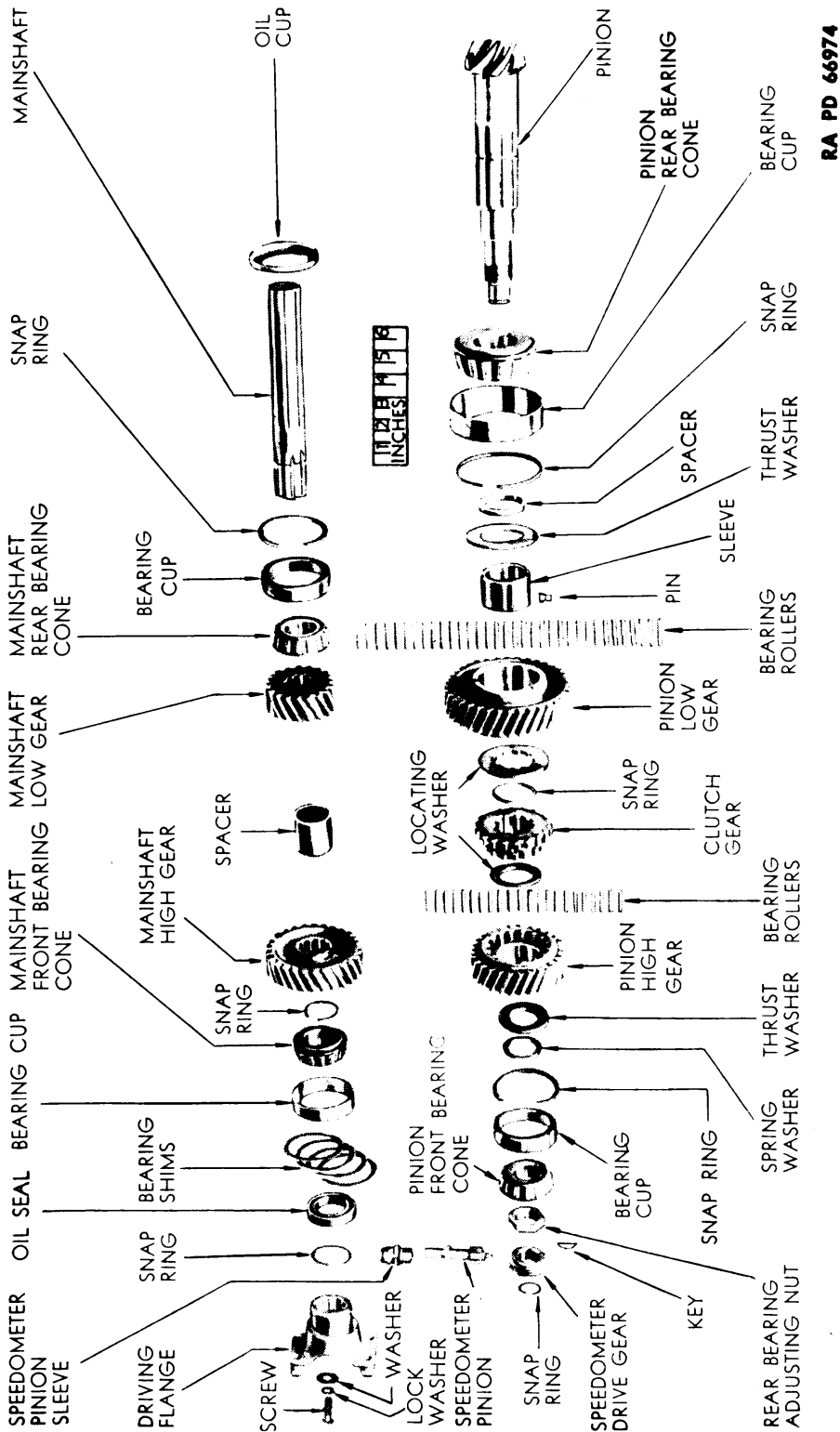
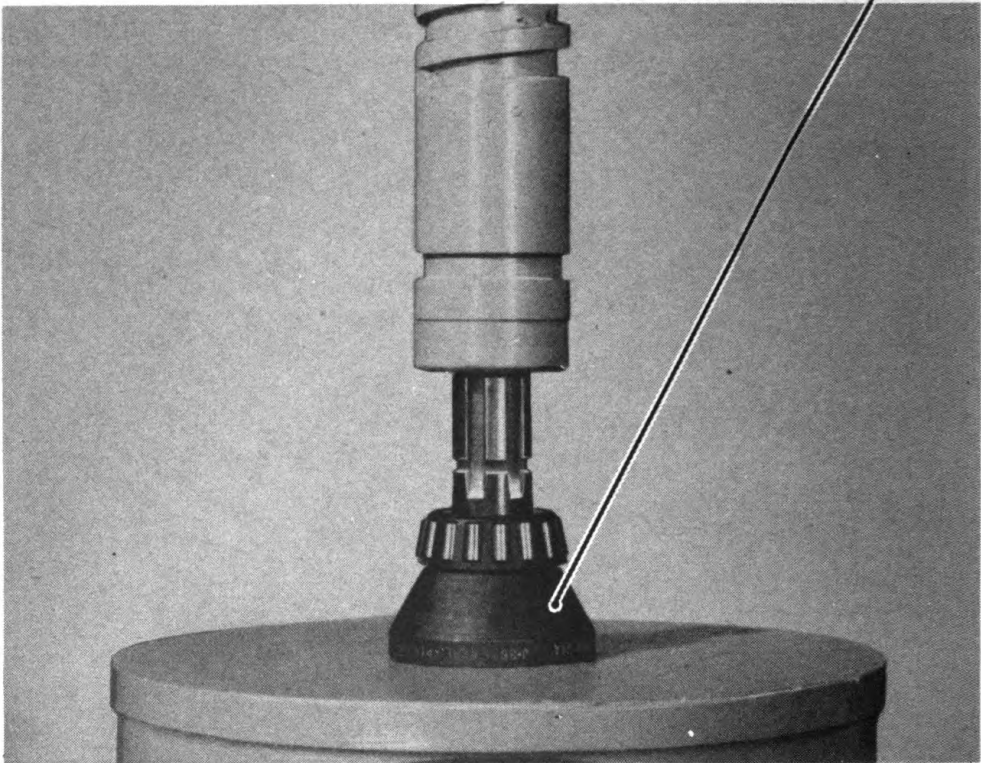


Figure 76—Axle Transmission Parts

**ORDNANCE MAINTENANCE
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ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**

MAINSHAFT OUTER BEARING REMOVER KM-J3625



RA PD 67139

Figure 77—Mainshaft Front Bearing Cone Removal

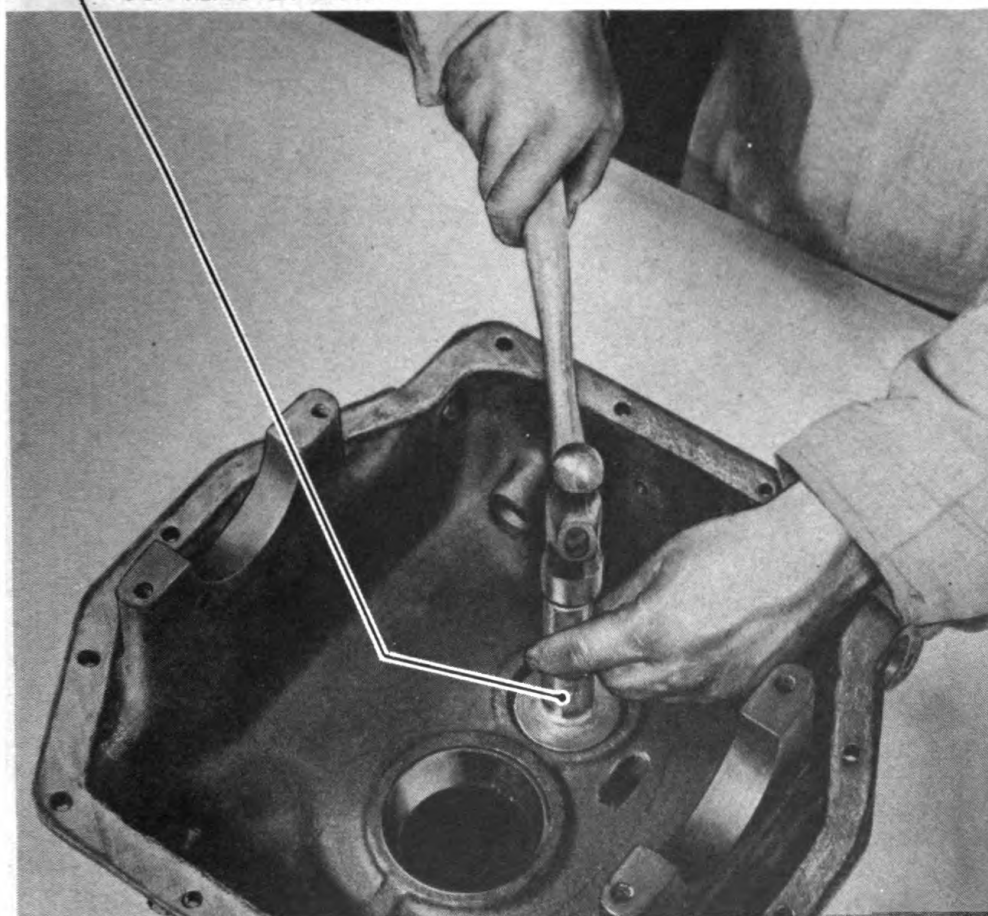
the low-speed gear bearing sleeve outer surface for scoring, or other damage. Check sleeve lock pin to make sure it is in a serviceable condition. Note the condition of the thrust washer and spacer. Examine pinion shaft carefully for damaged keyway or threads at the rear end, burs on the high-speed gear bearing rollers' surface, damaged splines, broken, chipped or damaged pinion teeth. If the pinion front and rear bearing cups were removed, examine the races for scoring, chipping, or other damage. Inspect high-speed gear and low-speed gear teeth for chipping or other damage; examine bearing roller race in the hubs of the gears for a galled or damaged condition. Inspect the two sets of bearing rollers for scoring, or damage. Check sliding gear teeth and splines for chipping, burs, or other damage.

c. **Repair.** If the pinion and parts are found to be unserviceable, and cannot be made serviceable by dressing or machining any rough portions, replace with new parts as required. If the spring washer, thrust washers, Woodruff key, and locating washers are unserviceable, replace them during reassembly. Install new snap rings and a pinion rear bearing adjusting nut on reassembly.

d. **Assemble.** If the pinion front and rear bearing cups were removed

AXLE TRANSMISSION COMPONENTS DISASSEMBLY, INSPECTION, REPAIR, AND ASSEMBLY

MAINSHAFT INNER BEARING
CUP REMOVER KM-J3630



RA PD 67137

Figure 78—Mainshaft Rear Bearing Cup Removal

and found to be unserviceable, install a new pinion rear bearing cup with the numbered side toward the snap ring in the case, using replacer KM-J3627 (fig. 73). Install front bearing cup with the numbered side next to the snap ring in the cover plate, using replacer KM-J3629 (fig. 74). Press pinion rear bearing cone on pinion shaft with numbered side next to pinion gear (fig. 75). Install low-gear spacer and thrust washer on pinion shaft. Place low-gear bearing sleeve and lock pin, with the pin nearest the front end of the pinion shaft, and drive the sleeve into place against the thrust washer. The lock pin must go between two of the splines.

75. MAINSHAFT, BEARINGS, AND GEARS.

a. **Disassemble** (fig. 76). If necessary the mainshaft front bearing cone may be pressed off the front end of the mainshaft after removing the snap ring with snap ring pliers (fig. 77). The mainshaft rear bearing cup may be driven out the front of the case with remover KM-J3630 (fig. 78). The mainshaft rear bearing oil cup may be driven out of the rear of the case

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ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**



RA PD 49448

Figure 79—Method of Removing Mainshaft Oil Seal

if necessary, using a $1\frac{7}{8}$ -inch arbor and hammer. If the rear bearing cup snap ring is broken, remove the pieces and install a new snap ring. If leakage has occurred at the front end of the mainshaft and inspection reveals that a new oil seal is required, remove the seal from the transmission front cover plate by pressing it out of the plate (fig. 79).

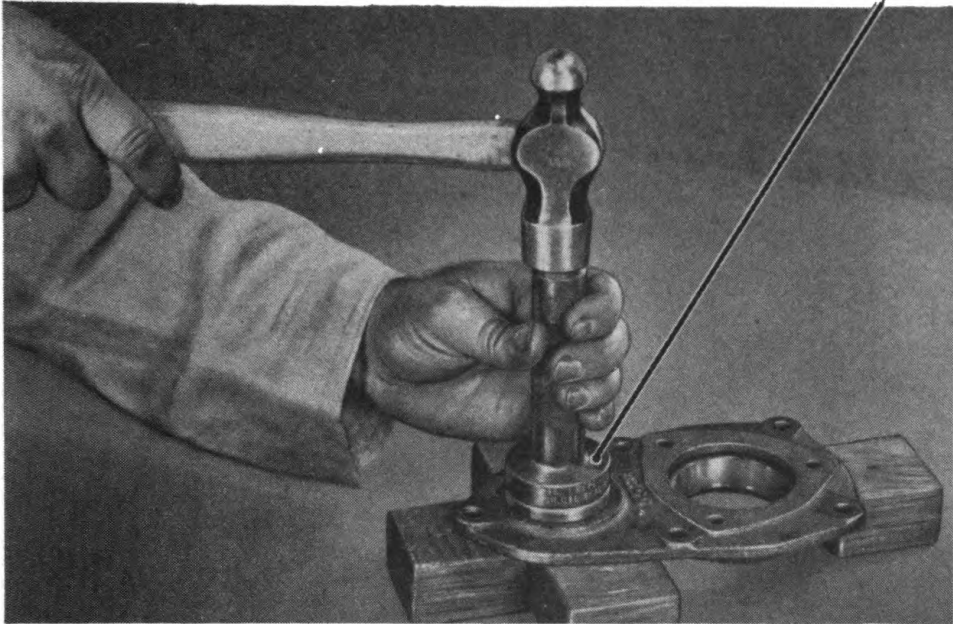
b. Inspection. Immerse all parts in SOLVENT, dry-cleaning, and wipe dry with a clean cloth. Check the rear bearing and front bearing cones for rough or damaged rollers. Inspect the mainshaft splines for burs or damage. Inspect the mainshaft low- and high-speed gears for chipped teeth and damaged splines. Inspect the gear spacer for possible damage. Examine the front and rear bearing cups for cracks or damaged races.

c. Repair. If the mainshaft and parts are found to be unserviceable, or cannot be made serviceable by dressing or machining, replace with new parts as required.

d. Assemble. If the mainshaft oil seal was removed, install a new seal into the front plate (replacer tool KM-J3621) with the flat side toward the inside and to within $\frac{1}{8}$ inch of the front plate inner surface (fig.

**AXLE TRANSMISSION COMPONENTS DISASSEMBLY,
INSPECTION, REPAIR, AND ASSEMBLY**

TRANSMISSION MAINSHAFT
OIL SEAL REPLACER KM-J3621



RA PD 67144

Figure 80—Installing Mainshaft Front Oil Seal



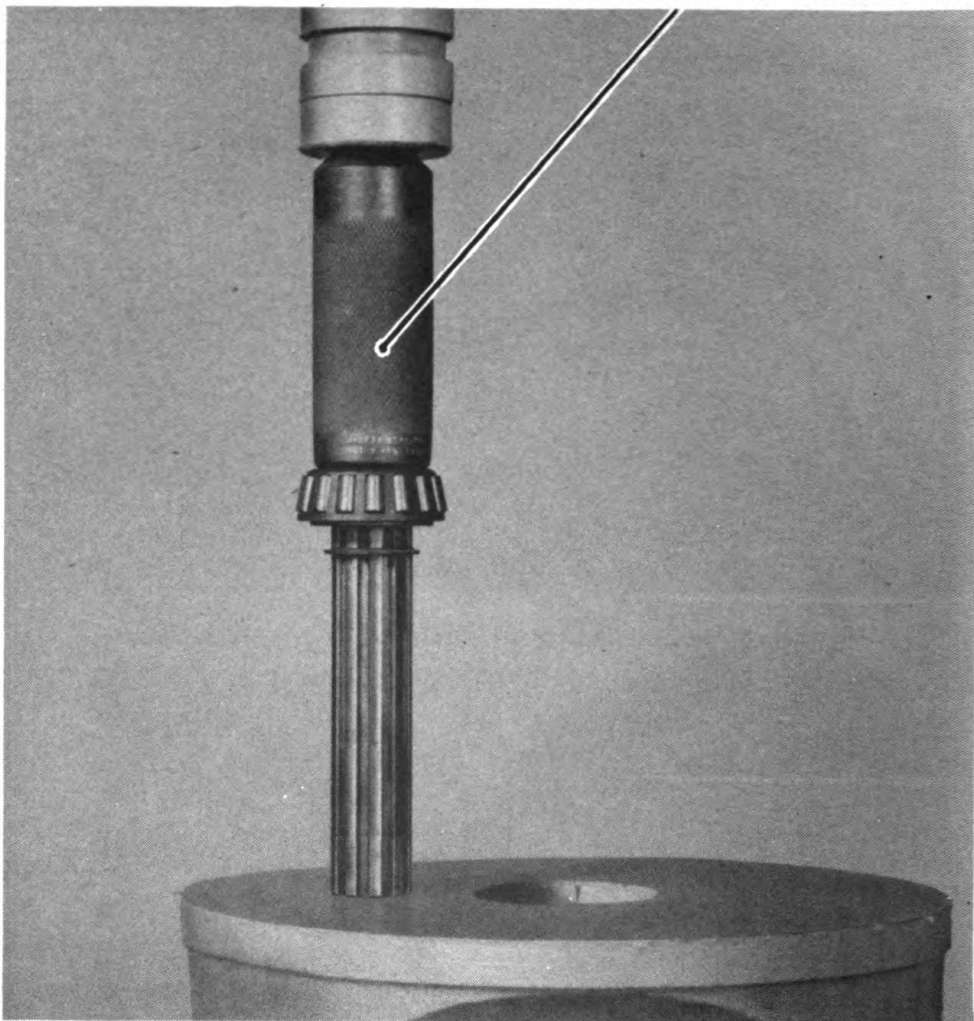
MAINSHAFT INNER BEARING CUP REPLACER KM-J3629

RA PD 67163

Figure 81—Mainshaft Rear Bearing Cup Installation

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POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
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MAINSHAFT OUTER BEARING CONE REPLACER KM-J3622



RA PD 67068

Figure 82—Mainshaft Front Bearing Cone Installation

80). If the mainshaft rear bearing oil cup was removed, install a new cup in the case with the extended edge forward so that it is flush with the case, using a 2 1/8-inch arbor and hammer. If removed previously, install a new mainshaft rear bearing cup, using replacer KM-J3629 (fig. 81). Install a new mainshaft front bearing cone with numbered side against snap ring, using replacer KM-J3622 (fig. 82).

76. CASE AND DRIVING FLANGE.

a. **Inspection and Repair.** Inspect the case for cracks or other damage. If the case is unsatisfactory and cannot be made serviceable by welding or machining, replace it. Refer to paragraph 19 for instructions covering the driving flange.

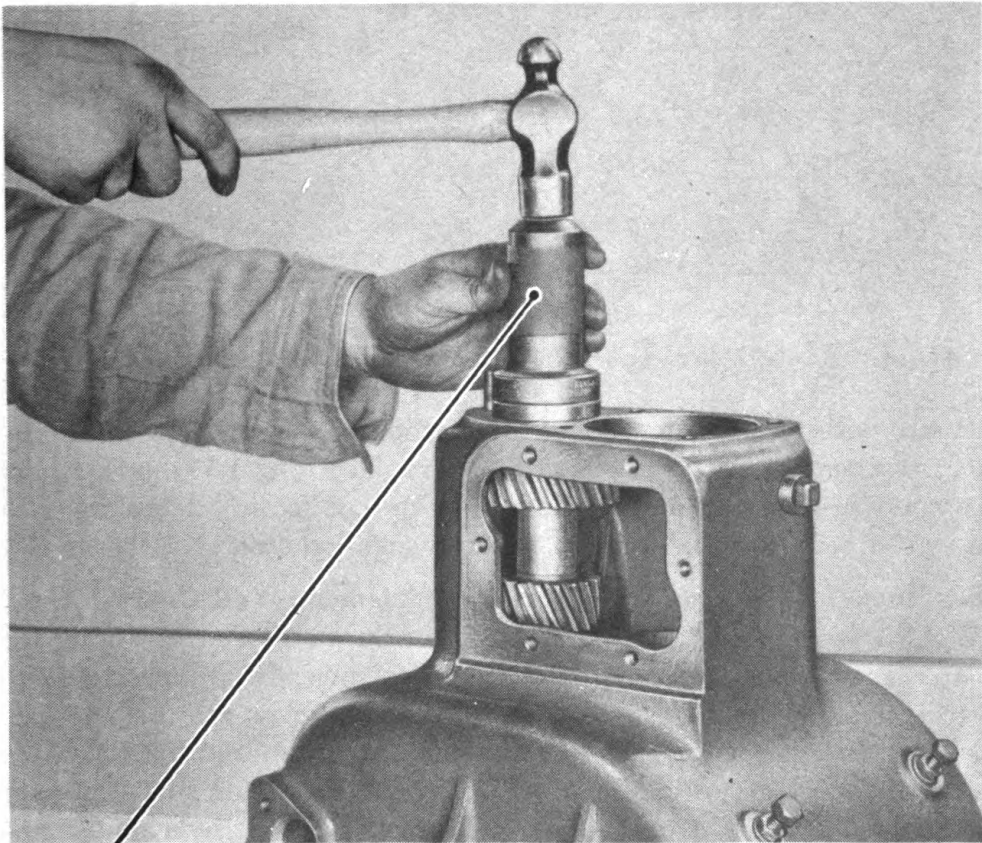
Section XVIII

**ASSEMBLY OF AXLE DIFFERENTIAL AND
TRANSMISSION COMPONENTS**

Assembly	Paragraph 77
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77. ASSEMBLY.

a. **Install Axle Transmission Mainshaft, Bearings, and Gears.** Apply SAE No. 10 engine oil to all parts before or during assembly. Insert rear end of the mainshaft with front bearing cone assembled, through the mainshaft front bearing bore in the case, and slide the mainshaft high-speed gear on mainshaft with the extension toward the rear. Slide spacer



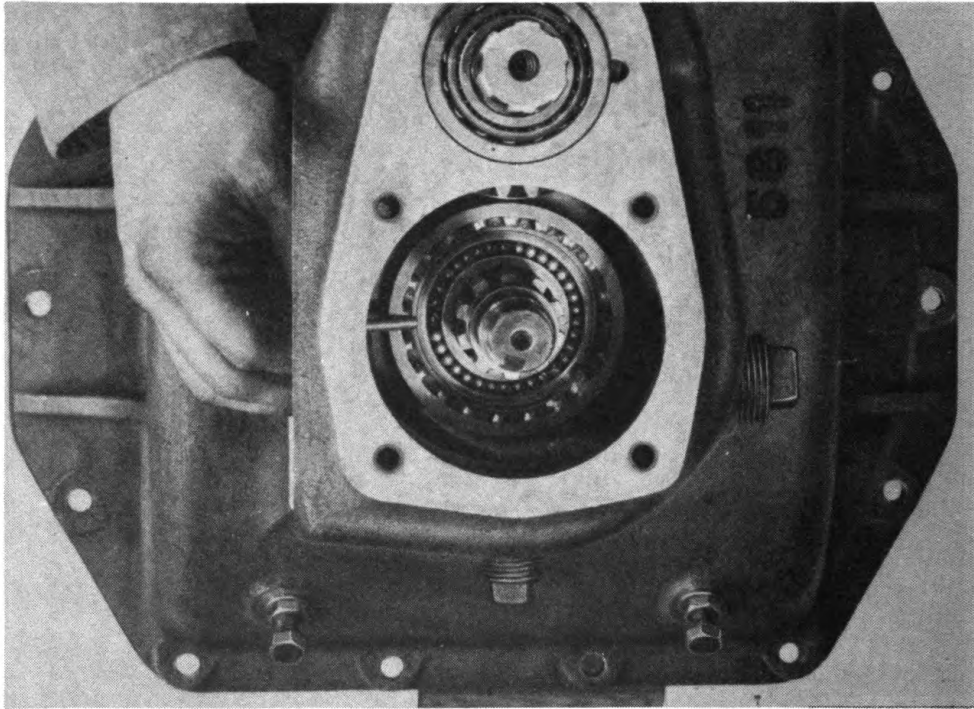
MAINSHAFT OUTER BEARING CUP REPLACER KM-J3624

RA PD 67172

Figure 83—Mainshaft Front Bearing Cup Installation

and the mainshaft low-speed gear on mainshaft with hub extension of gear toward front. Place mainshaft rear bearing cone into the cup and enter the rear end of shaft into rear bearing cone. Tap lightly on the front end of the mainshaft to start mainshaft into rear bearing cone. Revolve mainshaft to make certain that it is started straight in the rear bearing cone. Press main-

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ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**



RA PD 67157

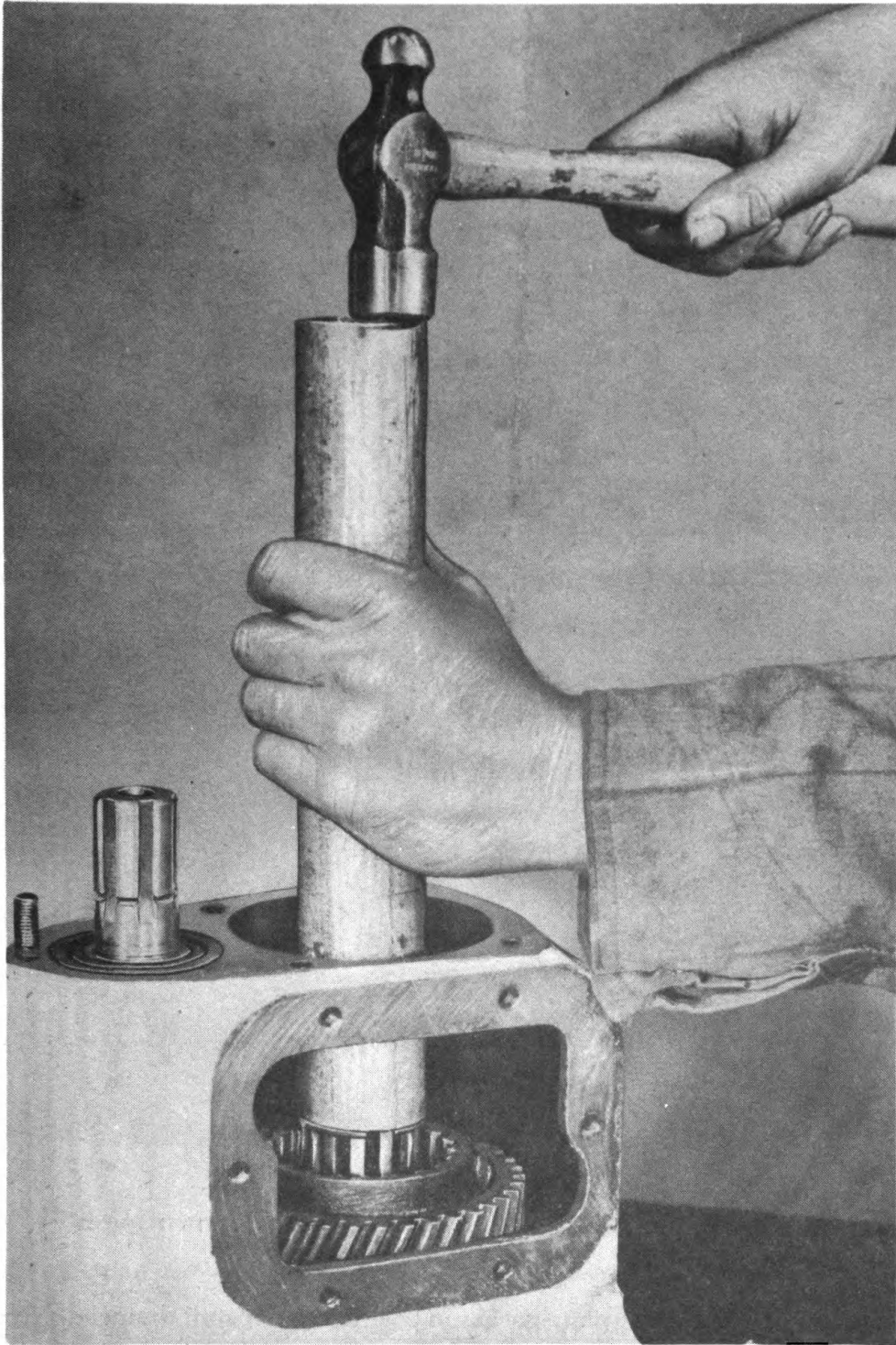
Figure 84—Pinion Low Speed Gear Rollers Installation

shaft into position with an arbor press and hollow mandrel. Install main-shaft front bearing cup with a KM-J3624 replacer (fig. 83), and procure the amount of shims required at the front of the cup to provide a shim pack that is flush with front face of the axle transmission case.

b. Install Axle Transmission Pinion, Bearing, and Gears. Apply SAE No. 10 engine oil to all parts before or during assembly. Insert the low-speed gear into case through shift cover opening with its internal teeth toward the front. Install pinion shaft front end through rear bearing cup and low-speed gear bore. Block up under the pinion and insert the 34 bearing rollers between the low-speed gear and the pinion shaft low-gear sleeve (fig. 84). Install bearing rollers, locating washer over end of the pinion shaft, and tap into position. Start a new snap ring over the pinion splines with snap ring pliers, and tap ring downward (fig. 85) until it enters the groove in pinion shaft so that the teeth on the large end of the gear mesh with internal teeth in low-speed gear. Install high-speed gear bearing rollers, locating washer and high-speed gear on pinion shaft with the internal teeth of gear toward sliding gear. Insert the 22 high-speed gear bearing rollers (fig. 86) and place thrust washer on pinion shaft against gear hub. Install spring washer on pinion shaft.

c. Install Axle Transmission Case Front Cover Plate. Place trans-

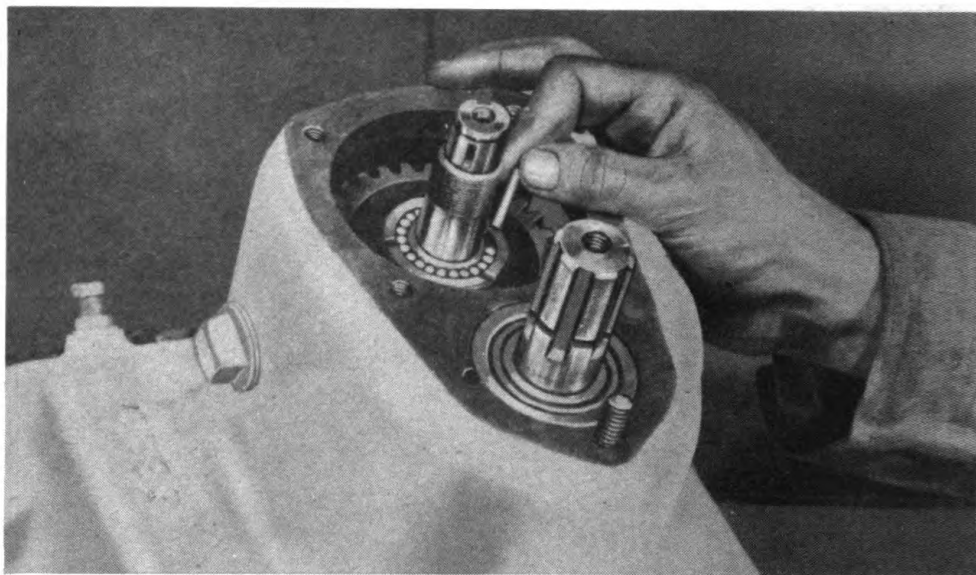
**ASSEMBLY OF AXLE DIFFERENTIAL AND
TRANSMISSION COMPONENTS**



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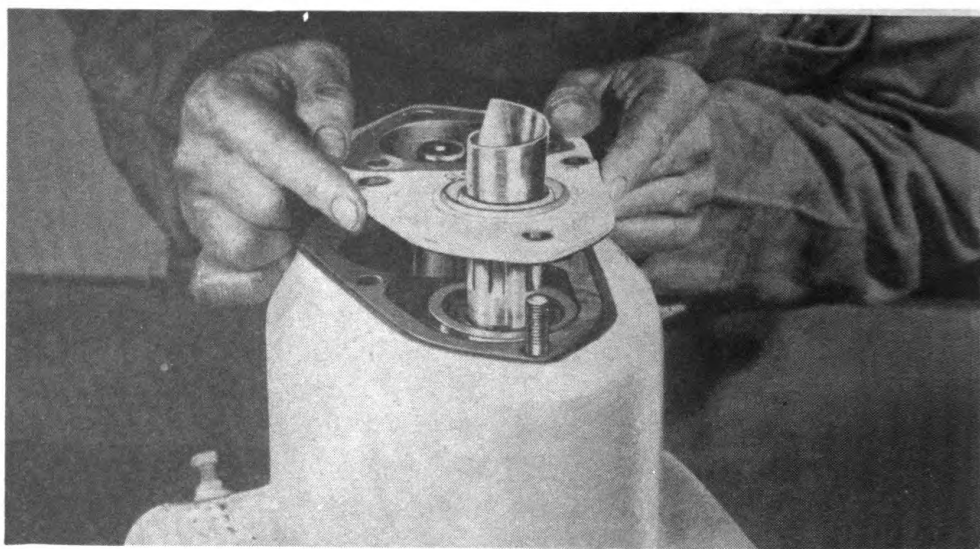
Figure 85—Pinion Low Speed Gear Snap Ring Installation

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RA PD 66972

Figure 86—Pinion High Speed Gear Bearing Rollers Installation

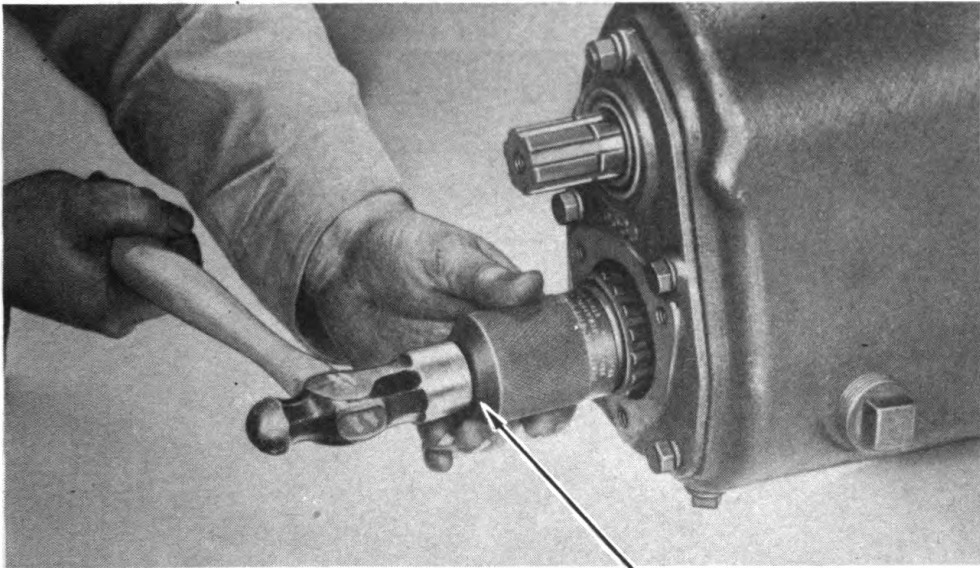


RA PD 66971

**Figure 87—Method of Installing Axle Transmission
Front Cover Plate**

mission case front cover plate gasket in position and install mainshaft front bearing shims. Install transmission case front cover plate, using a piece of shim stock around the splines on mainshaft to avoid damaging the oil seal leather (fig. 87). Install the four cap screws and one nut with lock washers and tighten securely. Place pinion front bearing cone over end of pinion

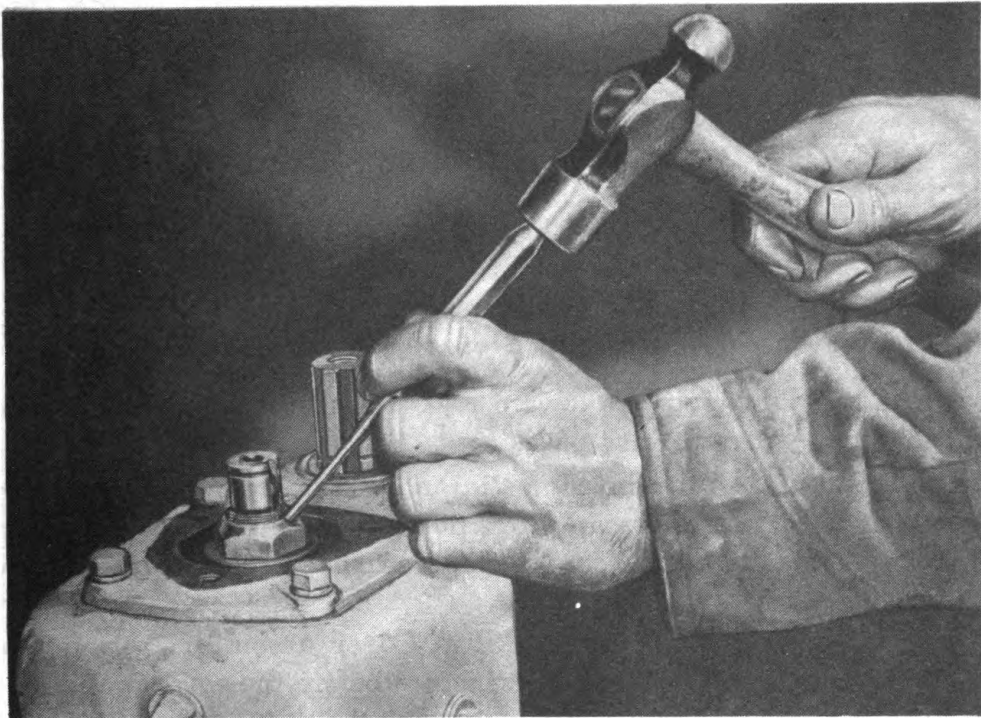
ASSEMBLY OF AXLE DIFFERENTIAL AND TRANSMISSION COMPONENTS



PINION OUTER BEARING CONE REPLACER KM-J3631

RA PD 67226

Figure 88—Installing Pinion Front Bearing Cone

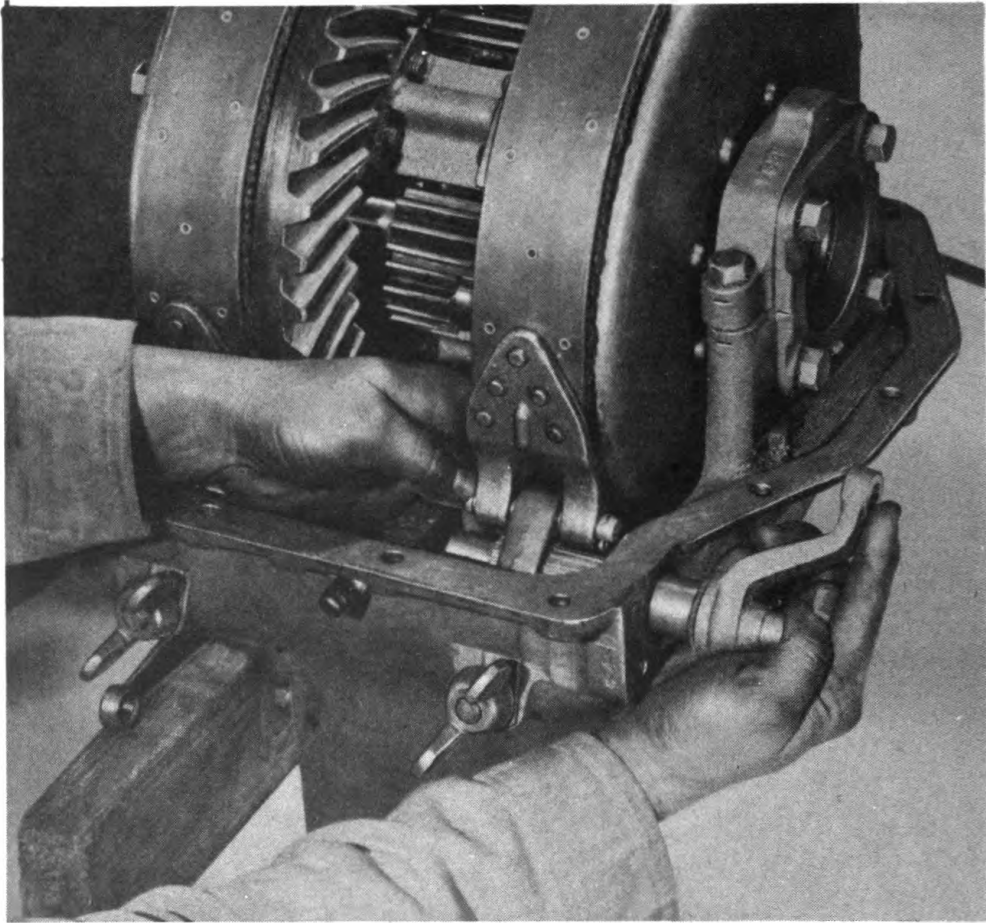


RA PD 66976

Figure 89—Locking Pinion Front Bearing Adjusting Nut

and drive it into position, using KM-J3631 replacer (fig. 88). Install pinion end play adjusting nut and tighten until pinion can just be turned free with the thumb and forefinger. Stake nut securely into groove in pinion shaft (fig. 89). Install speedometer drive gear Woodruff key and

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RA PD 67177

Figure 90—Installing Steering Brake Camshaft

gear with the numbered side toward rear. Install the speedometer drive gear snap ring with snap ring pliers.

d. Install Axle Transmission Pinion Rear Gearing Cap Assembly. Install pinion front bearing cap with a new gasket. Install cap screws and lock washer and tighten securely. Tighten speedometer pinion sleeve securely.

e. Install Axle Transmission Shift Cover Assembly. Apply SAE No. 10 engine oil to the shifting mechanism before the cover is placed in position. Install a new shift cover gasket and the shift cover, making sure that the fork enters groove in sliding gear. Install cap screws with lock washers and tighten securely.

f. Install Axle Unit Driving Flange. Install driving flange on splines at the front end with washers and cap screws. Test the axle transmission to make sure that the shafts, bearings, and gears rotate freely and the shifting mechanism operates properly.

ASSEMBLY OF AXLE DIFFERENTIAL AND TRANSMISSION COMPONENTS

g. Install Differential Assembly. Place differential side bearing cups over cones and set differential assembly with brake bands into position in case with bevel drive gear on right side (according to vehicle). Make sure that brake band studs enter holes in the upper portion of the case. Install right and left side bearing caps on their proper side, and tighten cap screws moderately to hold the differential assembly in position. Place new cork seals on the camshafts and insert the camshafts (with the clevises held just off a vertical plane and toward the rear) through their bores so that the splines on the camshafts mesh with splines in cams. Install adjusting lock plates and adjusting wing nuts on brake band studs. Install differential side bearing retainer plates with shims on their respective sides and tighten the cap screws until snug. Tighten the retainer plate screws that enter the case on each side, and then tighten the side bearing caps securely. Tighten retainer plate cap screws on each side that enter the side of the bearing cups.

h. Install Steering Lever and Cam Shaft. Place left steering lever with camshaft into cam on band so that upper side of lever and upper side of cam are in same plane (fig. 90). Install coil tension spring and then insert the retainer plate. Insert cap screw and tighten securely. Repeat the procedure to install the right steering lever and camshaft.

i. Install Axle Housing. Place a new housing gasket in position on the case using gasket sealer and install the axle housing with the cap screws and lock washers. Tighten the cap screws securely.

Section XIX

TEST AND ADJUSTMENT OF AXLE DIFFERENTIAL AND TRANSMISSION

	Paragraph
Test	78
Steering brake band adjustment	79

78. TEST.

a. Operate the axle transmission shift lever to shift the transmission alternately into the low- and high-speed positions. Turn the mainshaft driving flange to make sure that the internal parts rotate freely without excessive backlash.

79. STEERING BRAKE BAND ADJUSTMENT.

a. Three points of adjustment are provided for each brake band. Two of these points serve to maintain the correct contour of the lining with relation to the drum, and will require adjustment only when the axle unit has

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been disassembled. They consist of adjusting screws with locking nuts, one located in the housing and the other in the bottom of the case. The other adjustment, the one to compensate for wear of the lining, is located at the top of the case, and is controlled by the large wing nut.

b. To make an initial adjustment of the band, tighten the large wing nut to draw the lining into contact with the drum. Then loosen lock nuts on the lining to drum clearance adjusting screws. Turn the clearance adjusting screws clockwise until the screws contact the band. Then loosen the screws (turning counterclockwise two flats or $\frac{1}{8}$ turn of the screw) which will establish approximately 0.020-inch clearance between the end of the adjusting screws and the band. Hold screw heads stationary and tighten lock nuts securely. Loosen large wing nut one or two notches by turning the nut counterclockwise. (The forward face of each wing nut is notched so that it can be turned in stages of only $\frac{1}{8}$ turn at a time, and the adjustment must always be completed so that the wing nut notches are engaged with the stop ribs on the plate just ahead of the wing nut.) Remove cotter and clevis pin from clevis on camshaft and steering lever adjusting rod eye. Shorten or lengthen the link by turning the adjusting rod as required to produce approximately 1 to 2½ inches of free movement (at the upper end of the lever) before the effective stroke begins.

c. Install the clevis pin and a new cotter pin. Repeat the adjustment procedure on the other band and lever. Make sure that both levers have essentially the same braking effect, and that the linings are not dragging on the drums with the levers released. Place a few drops of engine oil on the lever pivot and clevis pins. Subsequent adjustments to compensate for lining wear will be made with the large wing nuts.

Section XX

**INSTALLATION AND TEST OF AXLE DIFFERENTIAL
AND TRANSMISSION**

Install axle unit.	Paragraph 80
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80. INSTALL AXLE UNIT.

a. **Place Axle Unit in Vehicle.** Attach KM-J3802 sling to the axle unit and raise with a hoist. Lower unit carefully into place. Aline bolt holes in flanges on each side with holes in the hull, using a drift for this purpose. Slide the shims into place, insert two locating pins on each side through opposite holes to hold the axle unit in position. Install six quarts

INSTALLATION AND TEST OF AXLE DIFFERENTIAL AND TRANSMISSION

of SAE No. 10 engine oil in the axle unit and check the level at the filler plug opening.

- b. **Install Final Drives.** Refer to paragraph 57.
- c. **Connect Axle Unit.** Place the transmission remote control shift rods in position, connect, and adjust them if necessary. Install the shift rods and connect the speedometer cable nut to the speedometer pinion sleeve.
- d. **Install Tracks.** Refer to paragraph 91.
- e. **Install Propeller Shaft.** Refer to paragraph 40.
- f. **Install Axle Cover.** Place axle cover in position and fasten with cap screws.
- g. **Install Floor Pan.** Lay hull floor pan in position and fasten with cap screws.
- h. **Install Seat Cushions and Seat Backs.** Insert seat back ears in slots in hull and fastening hook at back. Place seat cushions in position and fasten.
- i. **Install Top Bows and Top.** Install top bows in slots in coaming, cotter key and tighten wing nuts. Place top in position and lash securely.
- j. **Test.** Start engine and drive vehicle to check the operation of axle unit.

Section XXI

FITS AND TOLERANCES

Paragraph

Axle differential and transmission assembly service data 81

81. AXLE DIFFERENTIAL AND TRANSMISSION ASSEMBLY SERVICE DATA.

Location	Minimum Backlash
Mainshaft to pinion shaft high speed gears	0.005 in.
Mainshaft to pinion shaft low speed gears	0.005 in.
Pinion to bevel drive (ring) gear	0.006 in.
Between planet gears	0.008 in.
Planet pinions to axle shaft drive gears	0.010 in.
Planet gears to steering brake drum gears	0.012 in.
Mainshaft end play	Use shims behind rear bearing cup to produce no end play but without binding bearings.
Pinion end play	Tighten nut at rear bearing to produce no end play without binding together.

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Section XXII

**AXLE DIFFERENTIAL AND TRANSMISSION
CONTROLS AND LINKAGE**

	Paragraph
Axle transmission controls and linkage	82
Axle unit steering brake controls and linkage	83

82. AXLE TRANSMISSION CONTROLS AND LINKAGE.

a. Description (fig. 91). The axle transmission shift lever is located directly ahead of the steering levers in the driver's compartment. It is connected to the axle transmission shift lever by a cross shaft and rods fitted with adjustable clevises.

b. Removal of Axle Transmission Control and Linkage.

(1) **REMOVE HULL FLOOR PAN.** Remove the seats and cushions from hull floor, remove hull floor pan cap screws, and remove the hull floor pan from vehicle.

(2) **REMOVE ENGINE COMPARTMENT LID.** Loosen wing nuts and clamps, raise lid until engaging tongues on lid release from slots in hull coaming on right side, and remove lid from vehicle.

(3) **REMOVE INSTRUMENT PANEL.** Disconnect ground cable at the battery terminal. Disconnect primer knob from panel. Disconnect inlet and outlet pipes at coupling on primer. Remove screws holding instrument panel to side panel, move instrument panel inward and place on engine while removing engine compartment side panel.

(4) **REMOVE ENGINE COMPARTMENT SIDE PANEL.** Remove cap screws holding rear cross shaft cover in position. Remove wire harness from clip on back side of panel. Remove cap screws holding compartment side panel in position. Disconnect spotlight and compass light cables from sockets. Remove panel.

(5) **REMOVE REMOTE CONTROL LINKAGE.** Disconnect the axle transmission to cross shaft rod at the axle transmission and at the cross shaft by taking out the cotter pins holding the clevis pins in place and remove the clevis pins. Lift the rod from the vehicle. Remove the cross shaft to shift lever shaft rod by taking out adjustable clevis pins and lift out rod.

(6) **REMOVE AXLE TRANSMISSION SHIFT LEVER FROM FLOOR BRACKET.** Remove shift and steering lever floor bracket assembly as outlined in paragraph 83 c. Disassemble axle transmission shift lever from floor bracket by taking out cotter pin in left end of shaft holding shift lever.

AXLE DIFFERENTIAL AND TRANSMISSION CONTROLS AND LINKAGE

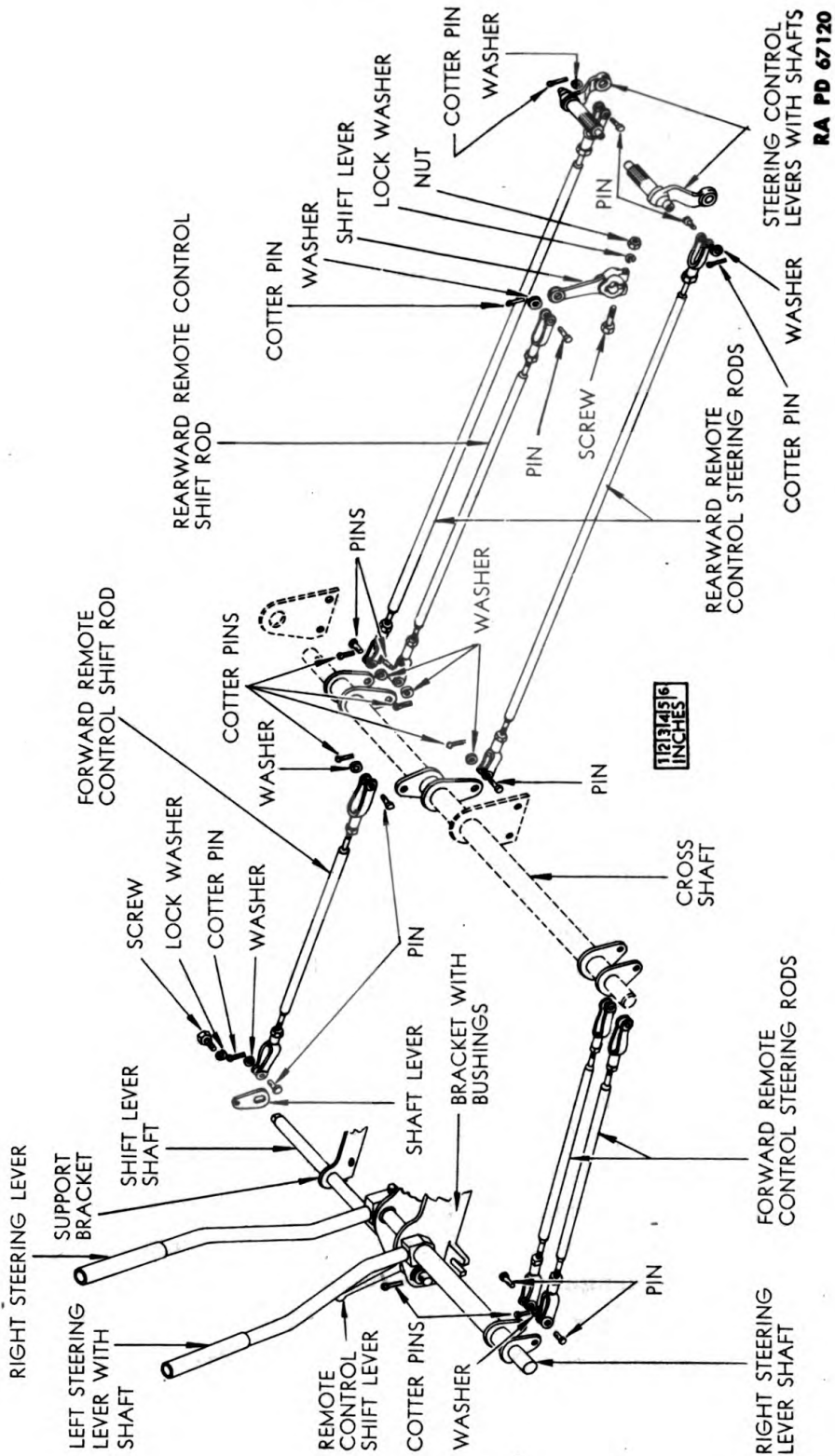


Figure 91—Axle Unit Controls and Linkage

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Loosen clamp bolt holding the lever to the shaft. Slip the shaft from the floor bracket and the side support bracket.

c. Inspection of Axle Transmission Controls and Linkage. Examine the shift lever, rods, and cross shafts for cracks, bends, or other damage. Inspect rods for stripped threads at adjustable clevis ends. Replace any damaged or broken parts.

d. Installation of Axle Transmission Control and Linkage.

(1) **REASSEMBLE AXLE TRANSMISSION SHIFT LEVER TO FLOOR BRACKET.** Slip shaft through side support bracket, floor bracket, shift lever and opposite side of floor bracket. Position the shift lever on the shaft and tighten the clamp bolt.

(2) **INSTALL REMOTE CONTROL LINKAGE.** Connect the shift lever shaft to the cross shaft rod by inserting pins through clevises on rod running from lever shaft arm to cross shaft arm. Place cross shaft to axle transmission rod in position, determine correct rod length for proper shift position (adjust length of rod with adjustable clevis if necessary), and fasten clevises to operating arms with clevis pins and cotter pin.

(3) **INSTALL INSTRUMENT PANEL, ENGINE COMPARTMENT SIDE PANEL, ENGINE COMPARTMENT LID AND FLOOR PAN.** Place engine compartment side panel in position and fasten securely with cap screws. Install rear cross shaft cover and fasten securely. Place wire harness in clip back of panel. Place instrument panel in position and fasten securely. Connect inlet and outlet primer pipes to couplings and tighten securely. Connect spotlight cable to upper socket on panel. Connect compass light cable to lower socket on panel. Place engine compartment lid in position by inserting tongues on lid in slots in right side of hull coaming, lower the lid to closed position, insert hold-down clamps in slots in side panel, and tighten wing nuts securely. Place floor pan in position and fasten with cap screws.

83. AXLE UNIT STEERING BRAKE CONTROLS AND LINKAGE.

a. Description. The steering and braking action of the vehicle is controlled by two levers mounted on cross shafts located directly in front of the operator. The levers connect to the axle unit by a series of rods and a cross shaft. All rods are equipped with adjustable clevises which permit adjustment of rod length to allow maximum lever action.

b. Removal of Axle Steering Brake Controls and Linkage.

(1) **REMOVE ENGINE COMPARTMENT LID, INSTRUMENT PANEL, SIDE PANEL AND FLOOR PAN.** Follow removal instructions in paragraph 82.

(2) **REMOVE STEERING AND SHIFT LEVER ASSEMBLIES.** Disconnect outer ends of steering lever cross shaft, transmission shift lever shaft at forward end and shift rods at rear cross shaft, by removing cotter pins and

AXLE DIFFERENTIAL AND TRANSMISSION CONTROLS AND LINKAGE

clevis pins. Remove cap screws in supporting bracket (right side of operator), remove cap screws from hull floor bracket supporting the transmission shaft lever and shaft, steering levers and axle differential transmission shaft lever and shaft. Remove entire assembly from vehicle for inspection, repair or replacement.

(3) **REMOVE REAR CROSS SHAFT.** This cross shaft is located directly back of operator. To remove the cross shaft, take out cap screws holding cross shaft cover in position and lift from vehicle. Disconnect steering control rods at outer end of shaft directly in back of operator, also at cross shaft to axle unit operating arms just inside engine compartment and at the extreme right end of shaft, by removing cotter pins and clevis pins. Disconnect axle differential transmission control rod at center of cross shaft by removing cotter pins and clevis pins from both front and rear end. Remove cotter pins and clevis pins from steering control rods at axle transmission external levers. Remove rods from vehicle. Remove cap screws in both cross shaft supporting brackets, remove cotter pin in extreme right end of cross shaft and move shaft to the right, tip slightly upward, and remove from vehicle for inspection, repair or replacement.

c. **Disassembly of Steering Levers from Hull Floor Bracket.** Remove cap screw and lock washer from right-hand steering lever. Remove lever and spacer. Slide solid shaft to the left through hull floor bracket and left-hand steering lever shaft.

d. **Inspection of Axle Unit Steering Brake Control and Linkage.** Inspect all control rods for condition of threads and distortion. If rods are bent they must be re-formed or replaced. Inspect all clevises for stripped threads, cracks or other damage. Repair or replace as necessary. Inspect each cross shaft for cracks in weld at points where operating arms are attached. Repair or replace as necessary. Inspect for looseness of arms on shaft. If loose, and welding is recommended, make sure that arms are properly positioned.

e. **Install Steering Levers to Hull Floor Bracket.** Reassemble solid shaft through tubular shaft from left side. Install the assembly through the left side of hull floor bracket. Install spacer and steering lever to solid shaft right side and tighten cap screw securely.

f. **Installation of Steering and Shift Lever Assemblies.** Place assembly in position on hull floor. Install cap screws to bracket and tighten securely. Install cap screws in bracket supporting transmission and axle differential transmission shafts on right side of hull, and tighten securely. Connect outer ends of steering lever shafts, transmission shift lever shafts, and axle transmission. Connect shift lever shaft at forward end by installing clevis pins and new cotter pins.

g. **Install Rear Cross Shaft.** Install spacer over right end of shaft.

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Tip cross shaft slightly to enter the assembly into hull bracket on left side. Install cap screws in cross shaft supporting brackets, and tighten securely. Install new cotter pin on right end of cross shaft.

h. Installation of Axle Unit Steering Brake Controls and Linkage.

(1) **INSTALL CONTROLS AND LINKAGE.** Connect axle differential transmission shift rod clevis to rear cross shaft with clevis pin and new cotter pin. Connect steering control rod clevises to rear cross shaft at the outer end and to the control shafts at hull floor bracket with clevis pins and new cotter pins.

(2) **INSTALL INSTRUMENT PANEL, ENGINE COMPARTMENT SIDE PANEL AND LID AND FLOOR PAN.** Follow installation instructions, paragraph 82.

CHAPTER 4

SUSPENSION SYSTEM, HULL, AND ATTACHMENTS

Section I

DESCRIPTION AND DATA

	Paragraph
Description and operation.....	84
Data	85

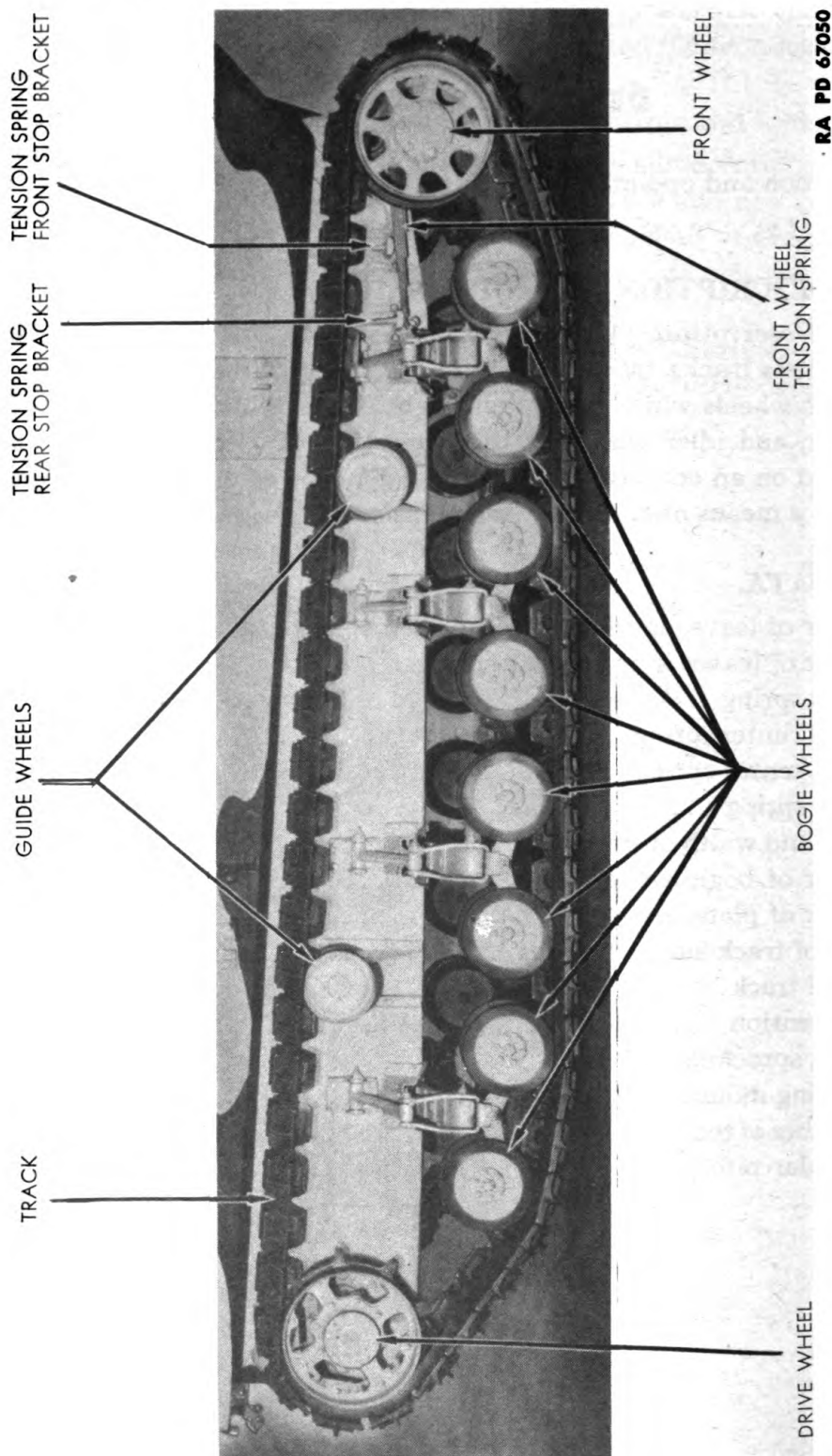
84. DESCRIPTION AND OPERATION.

a. **Description.** The suspension system of the vehicle includes the two endless tracks, transverse springs fastened to the bottom of the hull, 32 bogie wheels which carry the weight of the vehicle, driving wheels at the rear, and idler wheels at the front (fig. 92). The idler wheels are mounted on an eccentric arm which, by means of a spring arrangement, provide a means of adjusting track tension.

85. DATA.

Number of leaves in idler wheel tension spring.....	8
Number of leaves in transverse springs:	
Front spring	11 leaves
Front center spring.....	9 leaves
Rear center spring.....	9 leaves
Rear spring	13 leaves
Length and width of transverse spring.....	41½ x 2½ in.
Number of bogie wheels.....	32
Number of plates per track.....	56
Width of track support plates.....	15 in.
Pitch of track.....	4½ in.
Track tension	900 to 1000 lb
Driving sprockets:	
Bearing mounting	Full-floating
Number of teeth.....	9
Circular pitch	4½ in.

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Figure 92—Track and Suspension System

Section II

SUSPENSION SYSTEM TROUBLE SHOOTING AND TEST

	Paragraph
Trouble shooting	86
Test	87

86. TROUBLE SHOOTING.

a. Track Noisy.

Possible Cause	Possible Remedy
Worn track belt bands.	Replace track.
Bent grouser plates.	Straighten or replace.
Damaged or missing drive wheel sprocket teeth.	Replace drive wheel.

b. Track Slips or Runs Off Wheels.

Ice or foreign body lodged in suspension system.	Remove interference.
Inadequate track tension.	Adjust tension or replace damaged or broken parts.
Bent or otherwise damaged guide lugs.	Remove, straighten and replace or install new.

c. Front Wheel and Crank Arm Noise.

Sprung or damaged wheel or crank arm.	Straighten or replace parts as required.
Excessively worn or missing wheel rubber covering.	Replace wheel.

d. Front Wheel and Crank Arm, Other Abnormal Conditions.

Excessive wheel end play on crank arm.	Adjust bearings.
Wheel bearings rough, seized, or otherwise damaged.	Install new bearings complete.
Loss of wheel bearing lubricant.	Install new seal or gasket as required.
Excessive crank arm end play on support tube.	Readjust.
Worn crank arm bushings.	Replace.
Broken tension spring leaves.	Replace spring.
Damaged stop brackets or pads.	Replace parts as required.
Rusting or leakage at stop bracket mountings.	Replace gaskets.

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e. Bogie Wheel Assembly Noise.

Possible Cause	Possible Remedy
Worn or damaged wheel bearings.	Replace bearings complete.
Wheel rubber covering worn excessively.	Replace wheel.
Excessive wheel end play.	Adjust bearings.

f. Bogie Wheel Assembly, Other Abnormal Conditions.

Spring shackle seized or bolt broken.	Disassemble, free up, or replace parts as needed.
Spring leaf or parts damaged or broken.	Replace spring.
Bogie set out of alinement with track guide lug.	Straighten hull cross member extension bracket or replace parts as required.
Bogie wheel spring stops broken.	Install new stops.

g. Guide Wheels Noisy.

Excessively worn or missing wheel rubber covering.	Replace wheel.
Loose wheel support bracket.	Tighten bracket or replace if damaged.

h. Guide Wheel, Other Abnormal Conditions.

Wheel bearings worn or damaged.	Replace.
Lubricant leakage.	Replace seal and gaskets as required.
Support bracket shaft sheared or welding broken.	Replace support bracket assembly.
Wheel out of alinement with track guide lugs.	Straighten or replace support bracket.

87. TEST.

a. With the track and wheels in place on the vehicle, a superficial examination can be made for sheared track plate rivets, worn belt bands, bent grouser plates, lubricant leakage at the wheels, and missing or damaged external parts. Accumulations of snow or ice on the suspension system must be removed, as well as any foreign objects found to be interfering with normal track operation. The track tension should be checked frequently and adjusted if required, as directed in paragraph 92.

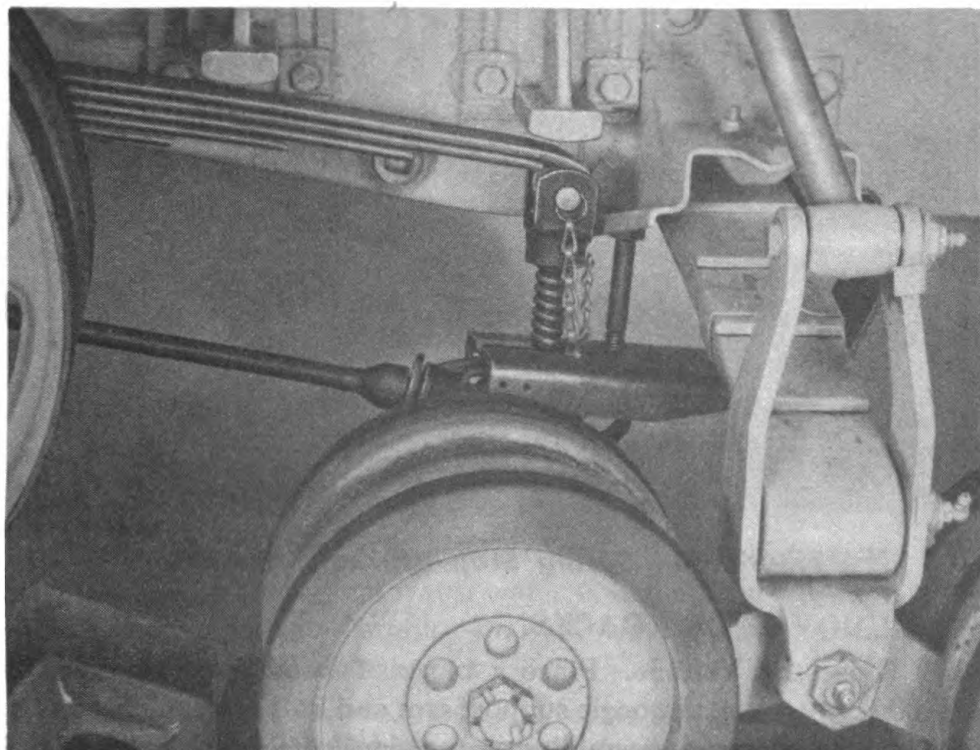
Section III

TRACKS

	Paragraph
Description	88
Removal of tracks.....	89
Cleaning and inspection of tracks.....	90
Installation of tracks.....	91
Adjustment of track tension.....	92

88. DESCRIPTION.

a. The track is composed of two rubber belts into which are imbedded four continuous steel cables with metal cross plates attached at 2¼-inch

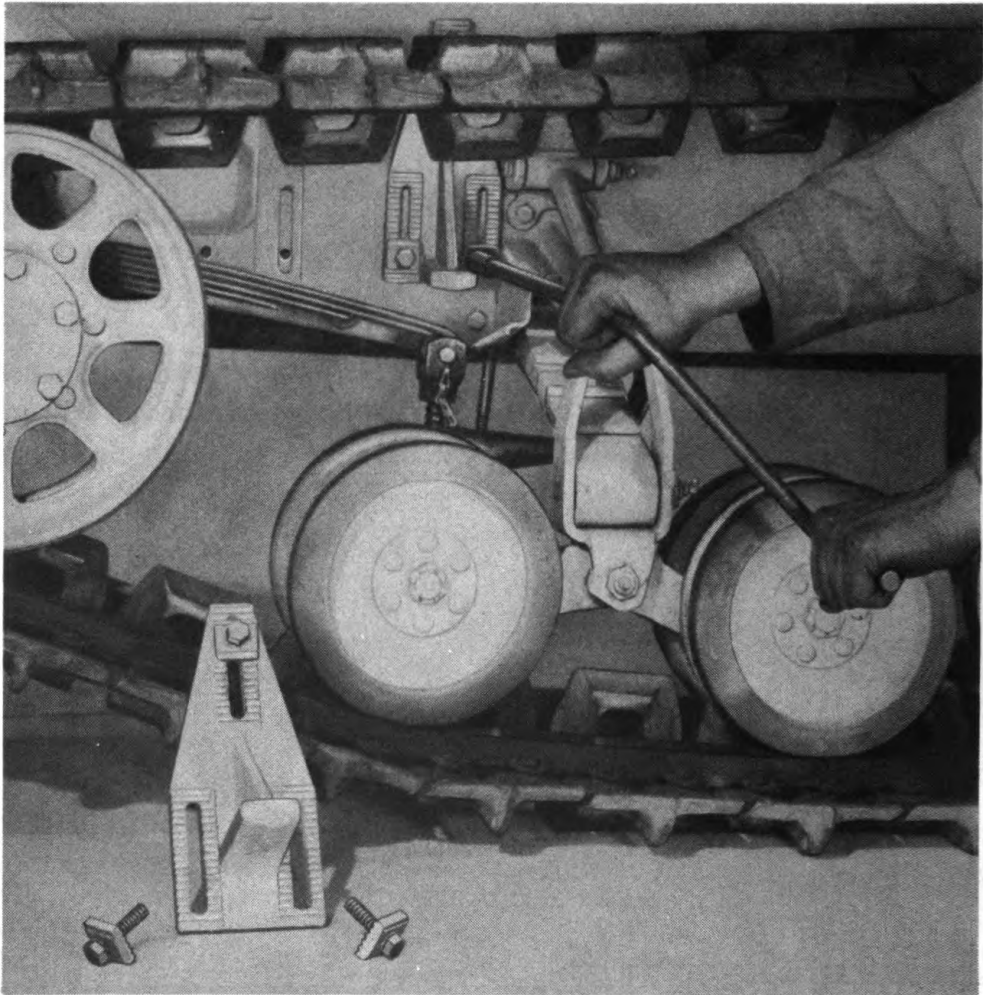


RA PD 67075

Figure 93—Pulling Track Tension Spring out of Contact with Stop Bracket

intervals. Ribbed steel rubber-covered plates and driving lug guide members are riveted to the cross plates. Sprocket teeth on drive wheel enter the openings in the guides to turn the track in either direction. A lug on each guide member directs the track on the supporting wheels. Two grousers are welded to each plate. Insofar as it is possible, the track is rubber-insulated throughout.

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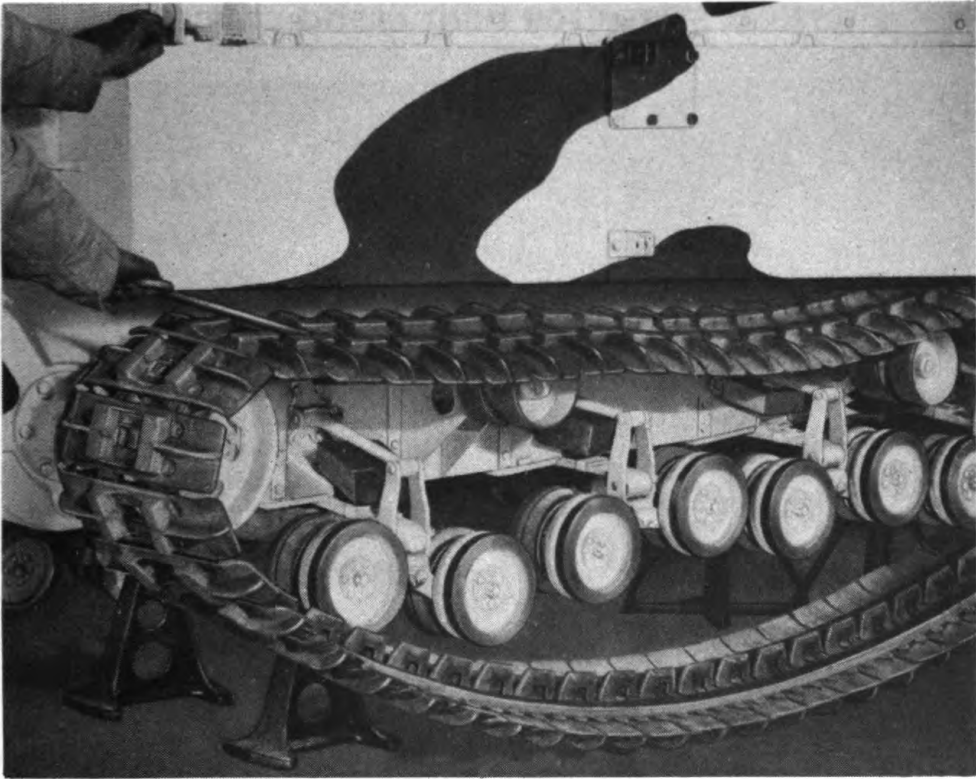
Figure 94—Spring Stop Brackets Removal

89. REMOVAL OF TRACKS.

a. **Raise the Vehicle.** Place a block of wood approximately 2½ inches thick between the bogie support arm and hull bracket. Follow this procedure on all bogie assemblies on the side from which track is to be removed. Raise the vehicle from the ground and block securely to free track from ground contact.

b. **Remove Spring Tension Adjusting Bracket.** Place jack bracket in position on hull support arm bumper bracket. Position jack in bracket, raise jack and insert pin through jack yoke and spring eye. Operate jack to pull spring downward and out of contact with rear adjustable bracket (fig. 93). Remove cap screw and lock washers holding brackets to hull, and remove brackets (fig. 94). Operate jack to lengthen jack screw, allowing spring to move upward. This will permit crank arm to move rearward and relieve tension on the track.

TRACKS



RA PD 67056

Figure 95—Vehicle Track Removal

c. **Remove the Track.** With the track tension relieved, lift track lugs out of guide wheels, rotate track rearward, pulling out and away from drive wheel until track clears the wheel by running off the rim (fig. 95).

90. CLEANING AND INSPECTION OF TRACKS.

a. **Cleaning Tracks.** The tracks must be thoroughly cleaned before inspection. Flush them with warm water under pressure to remove dirt, grease, and other foreign material. *Do not use dry-cleaning solvent* as it is injurious to the rubber on the tracks.

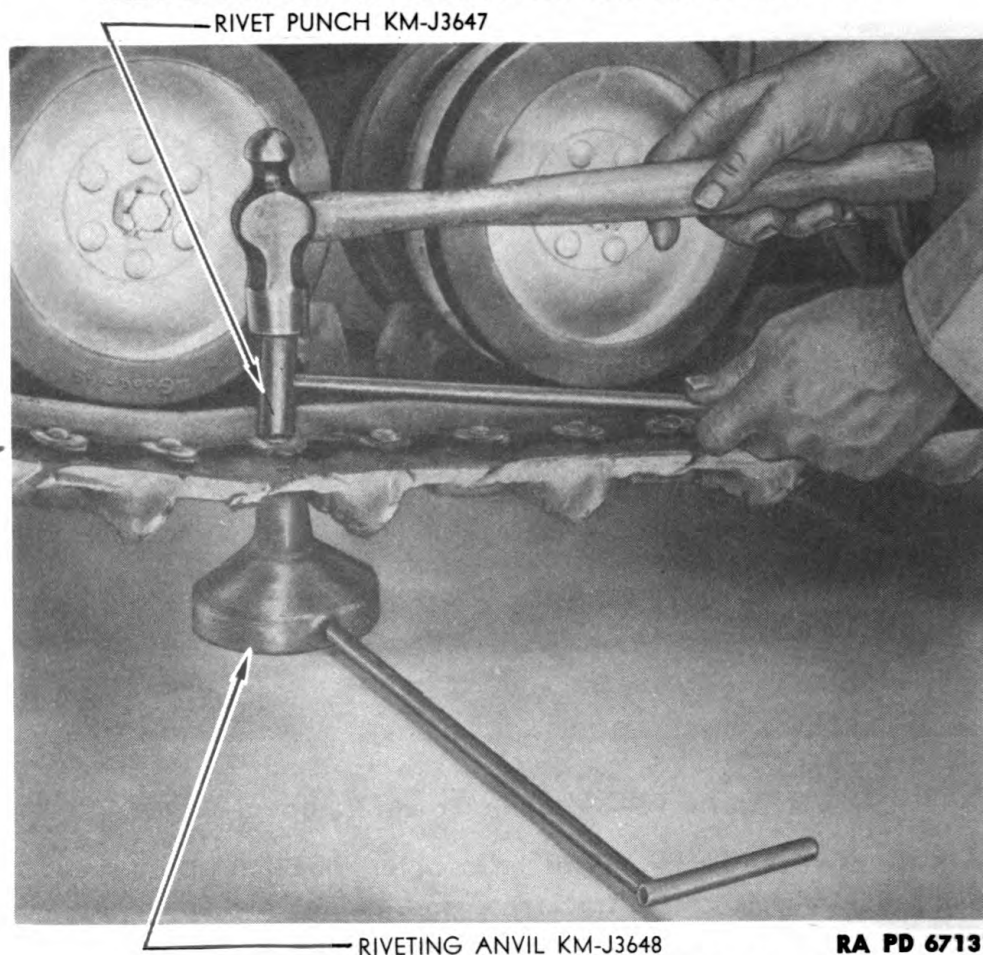
b. **Inspection of Tracks.** Inspect grouser plates and lugs for cracks, distortion, loose rivets or other damage. Note condition of rubber covering.

c. Repairing or Rebuilding.

(1) **LOOSE RIVETS.** If only a few track plate rivets are loose, they can be installed satisfactorily without removing track from vehicle. Use anvil KM-J3648 and rivet set KM-J3647 to perform the installation (fig. 96).

(2) **DAMAGED GROUSER PLATES, GUIDE LUGS.** Where bent or damaged grouser plate or guide lugs are observed and which cannot be straightened satisfactorily, the rivets securing the part to the track must be cut out, and damaged piece removed. New rivets of correct size must be used on installation of the new parts.

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RA PD 67131

Figure 96—Installing Track Rivet

91. INSTALLATION OF TRACKS.

a. Install Track. Place track over front wheel and guide wheels, start track over drive wheel. Rotate track upper section toward the rear while applying pressure on outer edge of track until guide lugs engage with drive wheel sprockets.

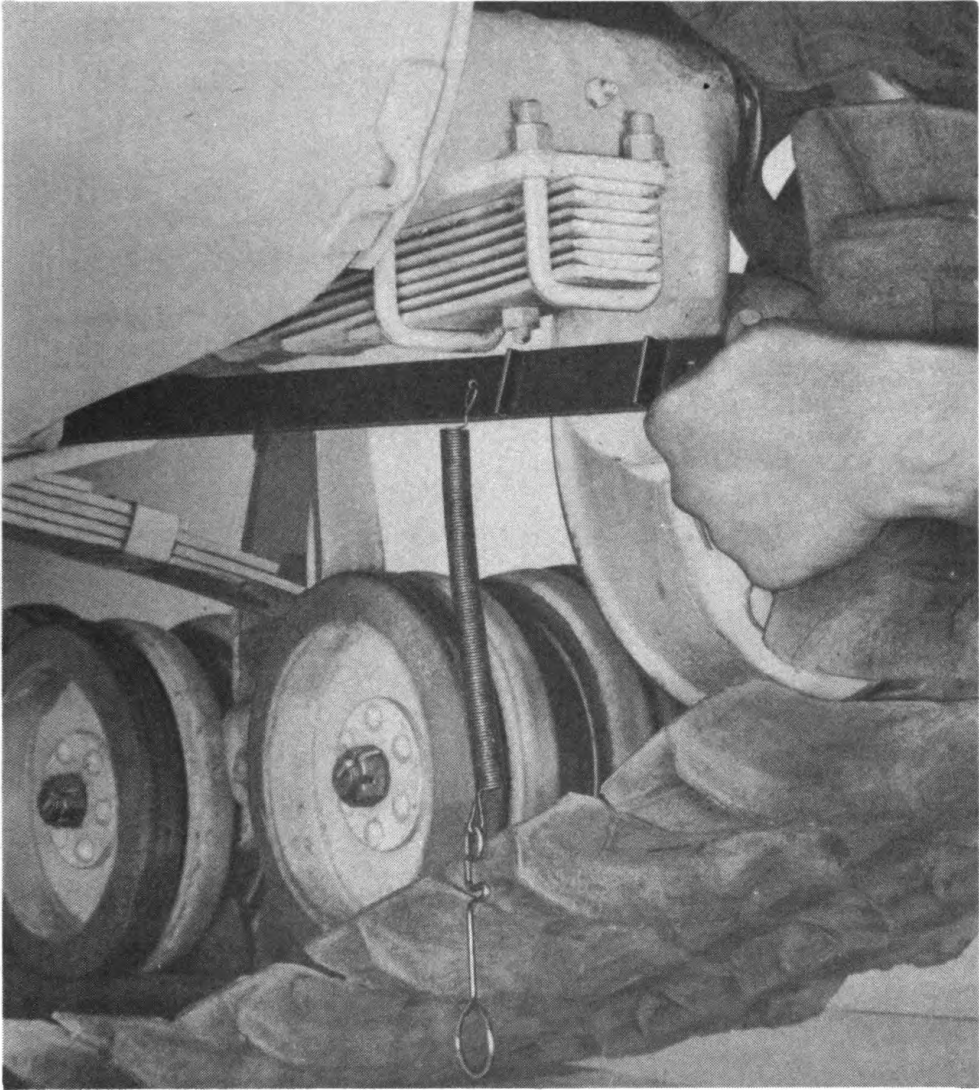
b. Install Spring Tension Adjusting Bracket. Place jack with bracket in position on hull bracket. Raise jack until pin can be inserted through jack yoke and spring eye. Operate the jack to pull spring downward to point where both adjustable brackets can be attached to the hull. Install cap screws and lock washers and tighten securely. Release spring and remove pin, jack and bracket from vehicle.

92. ADJUSTMENT OF TRACK TENSION.

a. Check and Adjust Track Tension.

(1) **CLEAN.** Clean any mud or debris off machined edge of the front wheel spring seat.

TRACKS



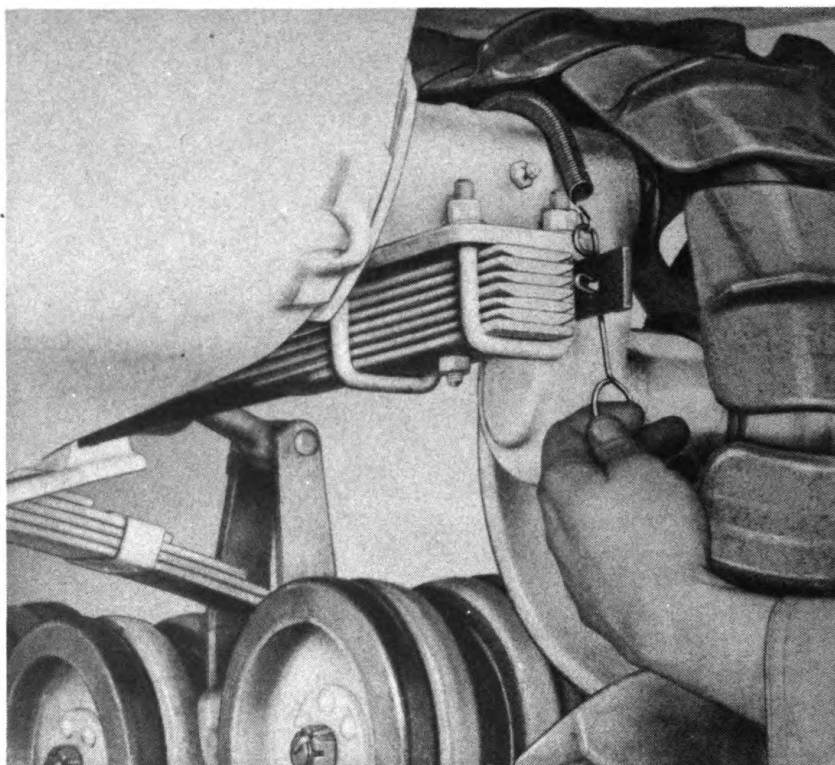
RA PD 67081

Figure 97—Positioning Track Tension Gage

(2) **METHOD OF CHECKING TRACK TENSION.** With pointer of track spring tension gage toward the rear, engage locating ears at the front of the gage between spring U-bolts and flat machined surfaces of spring seat (fig. 97). Draw gage hook and spring up and around crank arm, and engage hook in hole near front of gage (fig. 98).

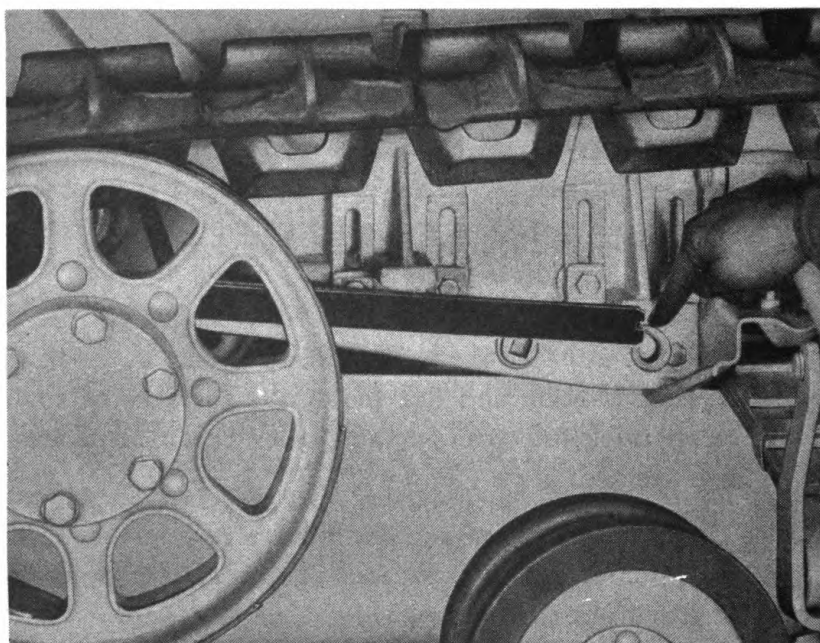
(3) Note the position of gage pointer with relation to top leaf of spring (fig. 99). If pointer is below top leaf of spring, or bottom of adjusting bracket, the track tension is too tight. If above top of spring leaf or bottom of bracket, track is too loose. In either case, track tension must be adjusted by loosening bolts holding adjustable brackets to hull and rising

ORDNANCE MAINTENANCE
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RA PD 67083

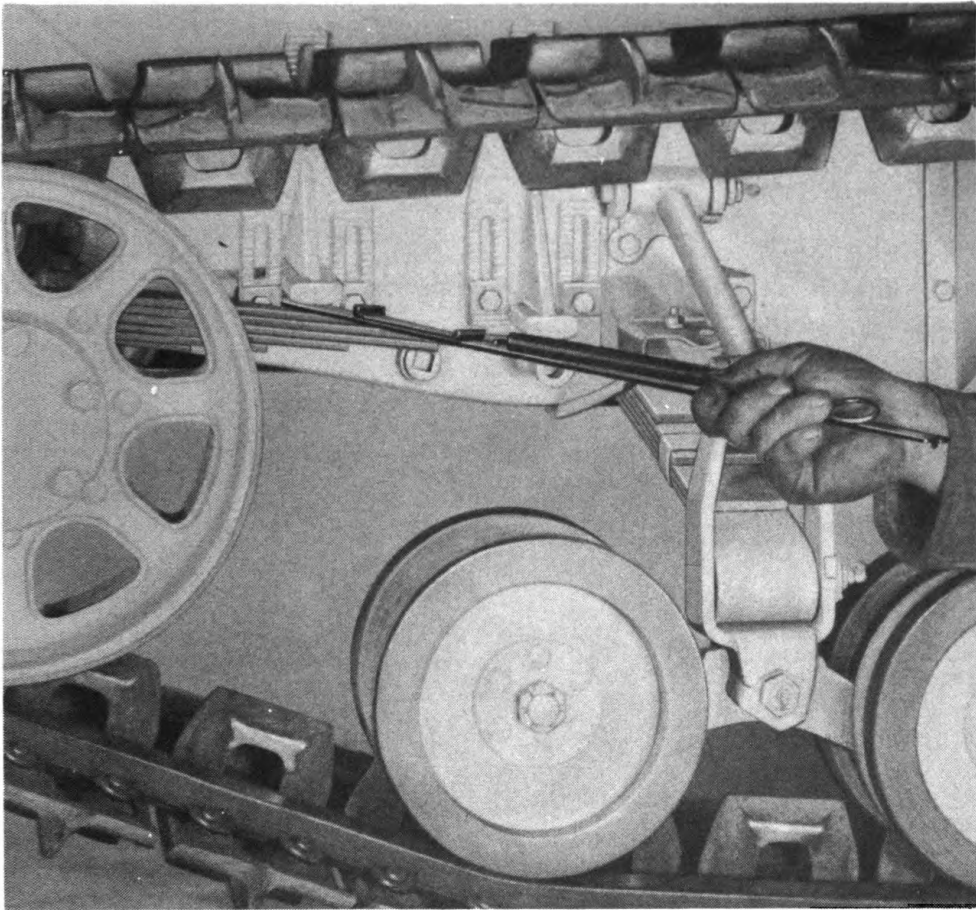
Figure 98—Hooking Track Tension Gage in Place



RA PD 67101

Figure 99—Checking Track Tension

TRACKS



RA PD 67103

Figure 100—Checking Clearances at Front Stop Bracket

to lower the tension or lowering to increase the tension as necessary. Make sure that the serrations on the bracket in bolt spacer are engaged.

b. Method of Adjusting Track Tension.

(1) **ADJUST TRACK TENSION.** To adjust track tension pull rear end of tension spring downward by positioning front wheel tension spring bracket under support arm bumper bracket and placing vehicle jack screw through slot in the bracket. Place bracket on top of jack screw over top leaf spring eye and insert pin through jack bracket and spring eye and operate jack to pull spring downward. Raise or lower the adjustable bracket to position the height of spring to coincide with tip of gage pointer. After adjustments have been completed make sure serrations on bracket engage those on bolt lock plate and tighten securely.

(2) **CHECK AND ADJUST CLEARANCE AT FRONT STOP BRACKET.** Using the $\frac{5}{16}$ -inch thickness gage (front end of pointer gage), check clearance between front stop (adjustable) bracket and top leaf of spring (fig. 100). If more or less than $\frac{3}{16}$ -inch clearance exists at this point, readjust bracket as necessary. Usually the front stop or safety bracket will require adjusting at the same time as the rear one to maintain the $\frac{3}{16}$ -inch clearance.

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Section IV

FRONT WHEEL AND CRANK ARM CARRIER

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Description.....	93
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Cleaning of parts.....	95
Inspection and repair of components.....	96
Installation of crank arm carrier assembly and front wheel.....	97

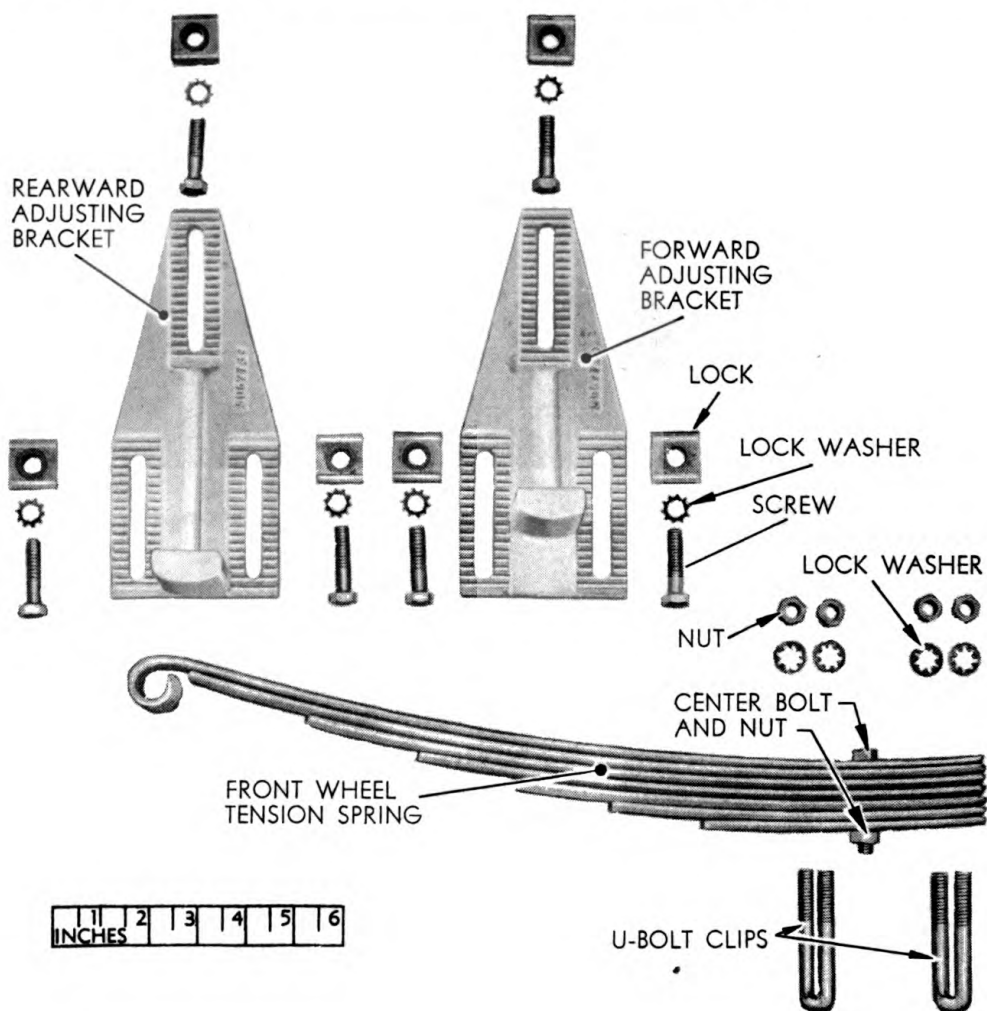
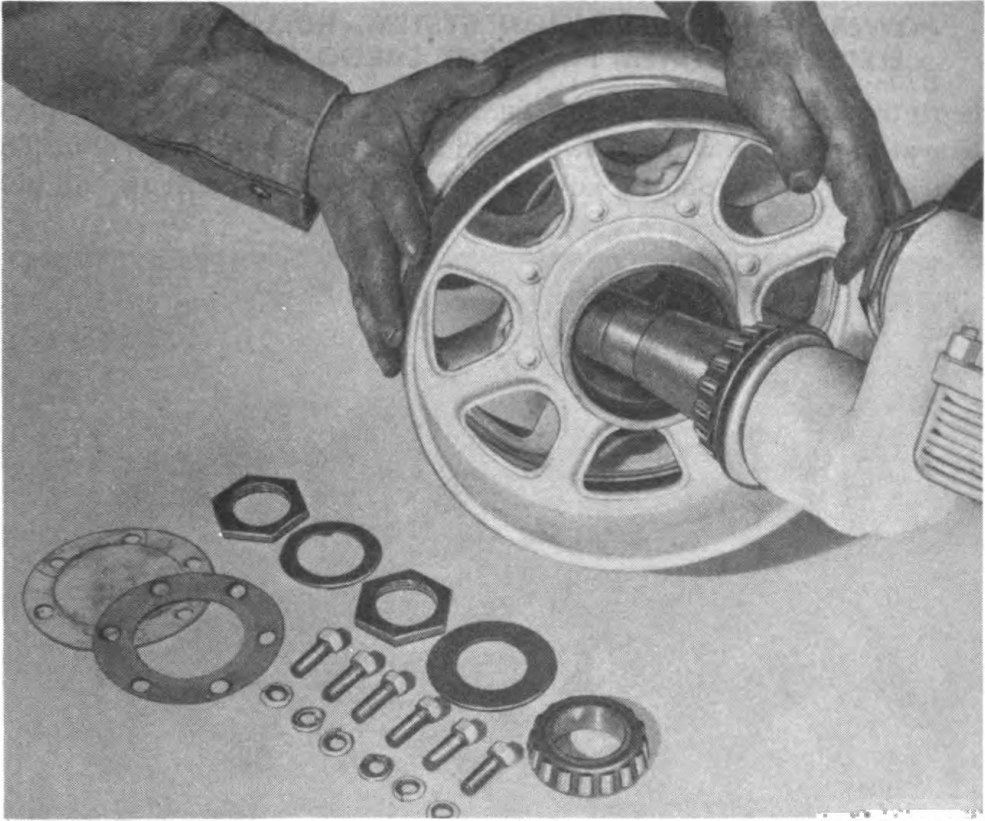


Figure 101—Track Tension Spring and Bracket Parts

93. DESCRIPTION.

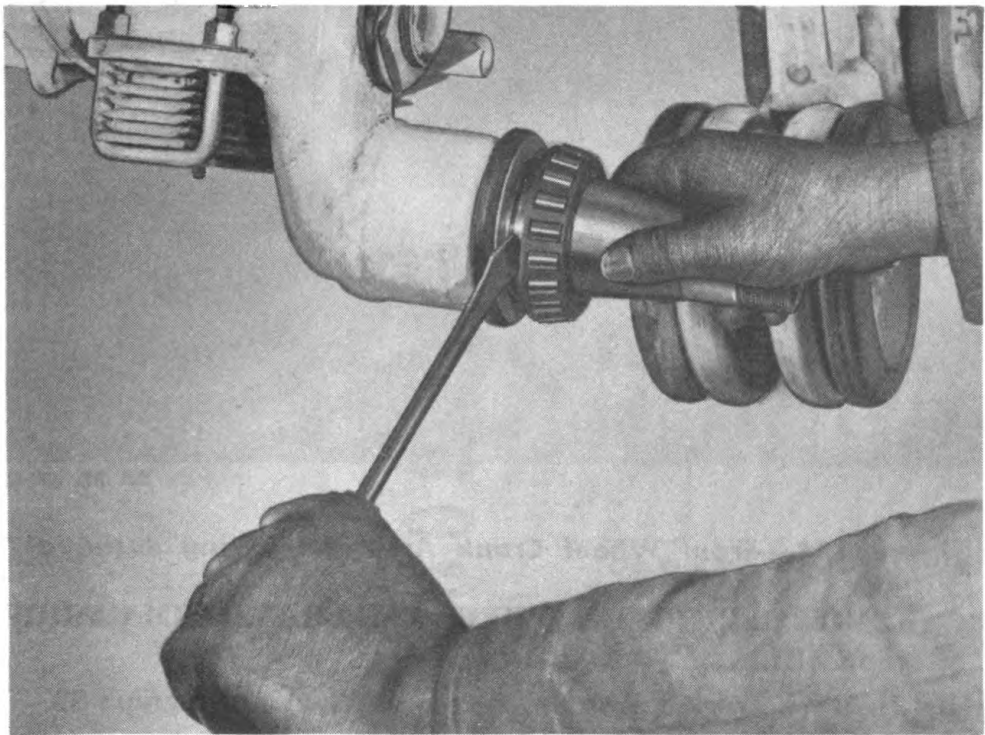
a. **Description.** The front wheels are mounted on spindles on either side of the hull, and by means of a crank arm and spring arrangement pro-

FRONT WHEEL AND CRANK ARM CARRIER



RA PD 67071

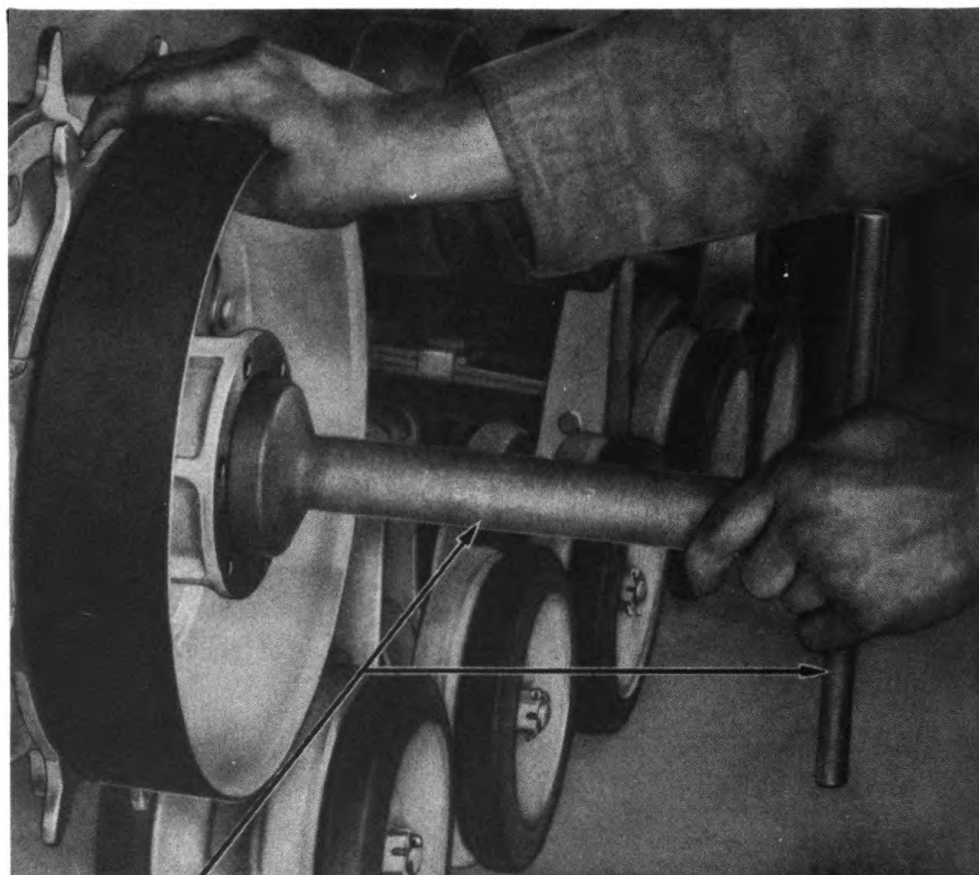
Figure 102—Front Wheel Removal



RA PD 67048

**Figure 103—Method of Removing Front Wheel
Inner Bearing Cone**

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BEARING LOCK NUT WRENCH KM-J3603

RA PD 67064

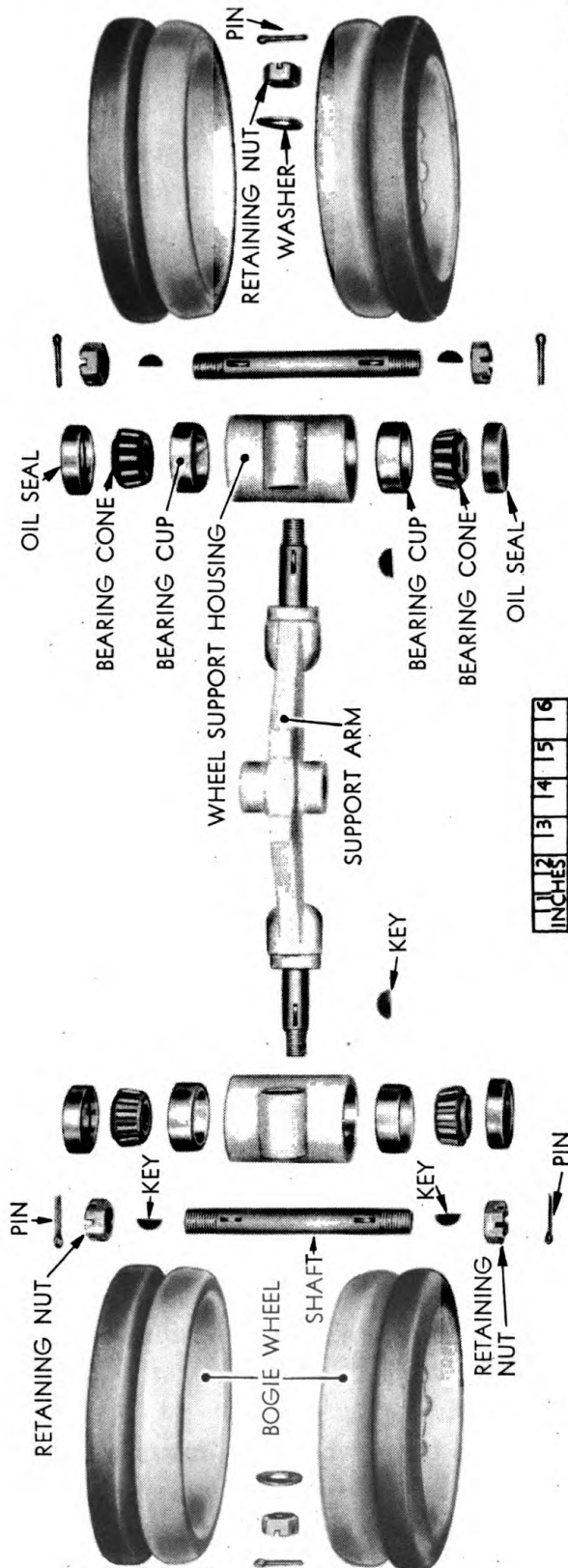
Figure 112—Method of Adjusting Front and Drive Wheel Bearings

Section V

BOGIE WHEEL ASSEMBLY AND SUSPENSION

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Disassembly of bogie wheel assembly.....	100
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Inspection and repair of bogie wheel assembly parts.....	102
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Installation of bogie wheel assemblies.....	104
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Installation of bogie wheel assembly suspension parts.....	108

BOGIE WHEEL ASSEMBLY AND SUSPENSION



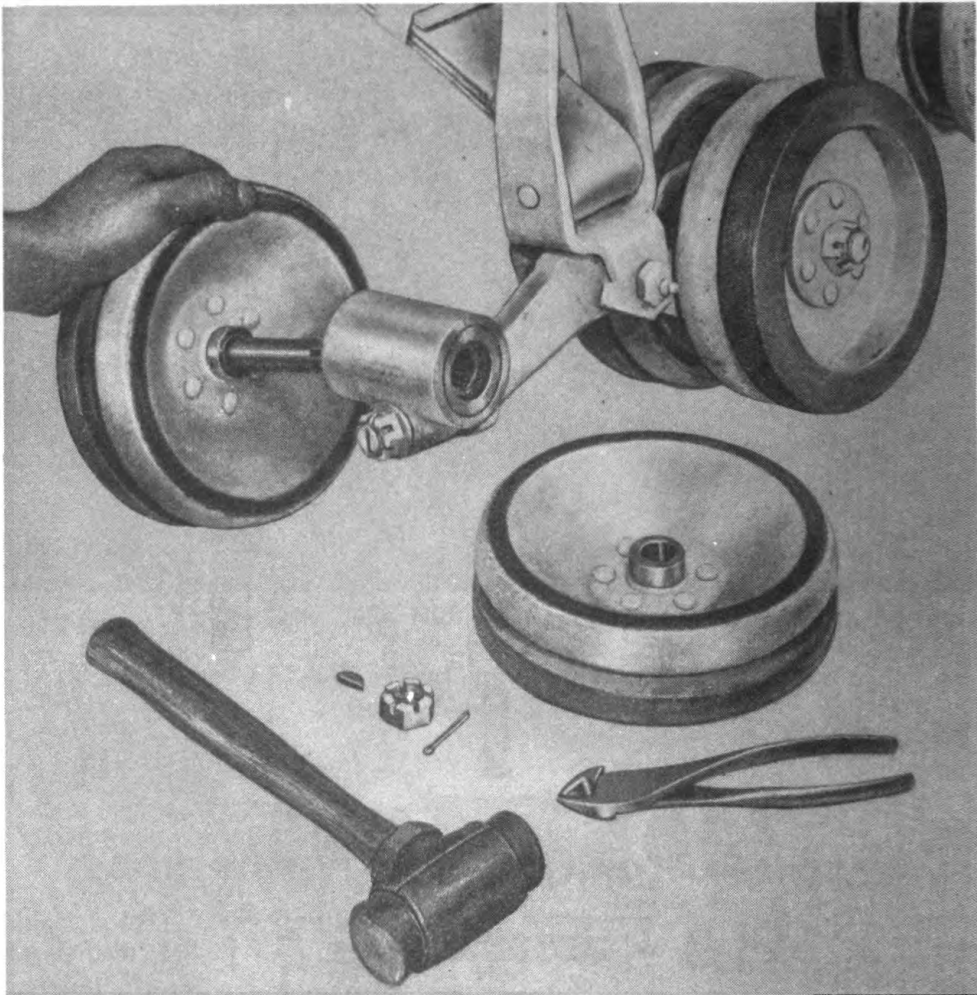
RA PD 67241

Figure 113—Bogie Set Parts

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98. DESCRIPTION.

a. Sixteen bogie wheels on each side of the hull carry the weight of the vehicle. The wheels are supported, in sets of four, by transverse springs fastened to the bottom of the hull. A bogie spring support yoke is fastened to each end of the spring and the bottom of the yoke fastens to a bogie

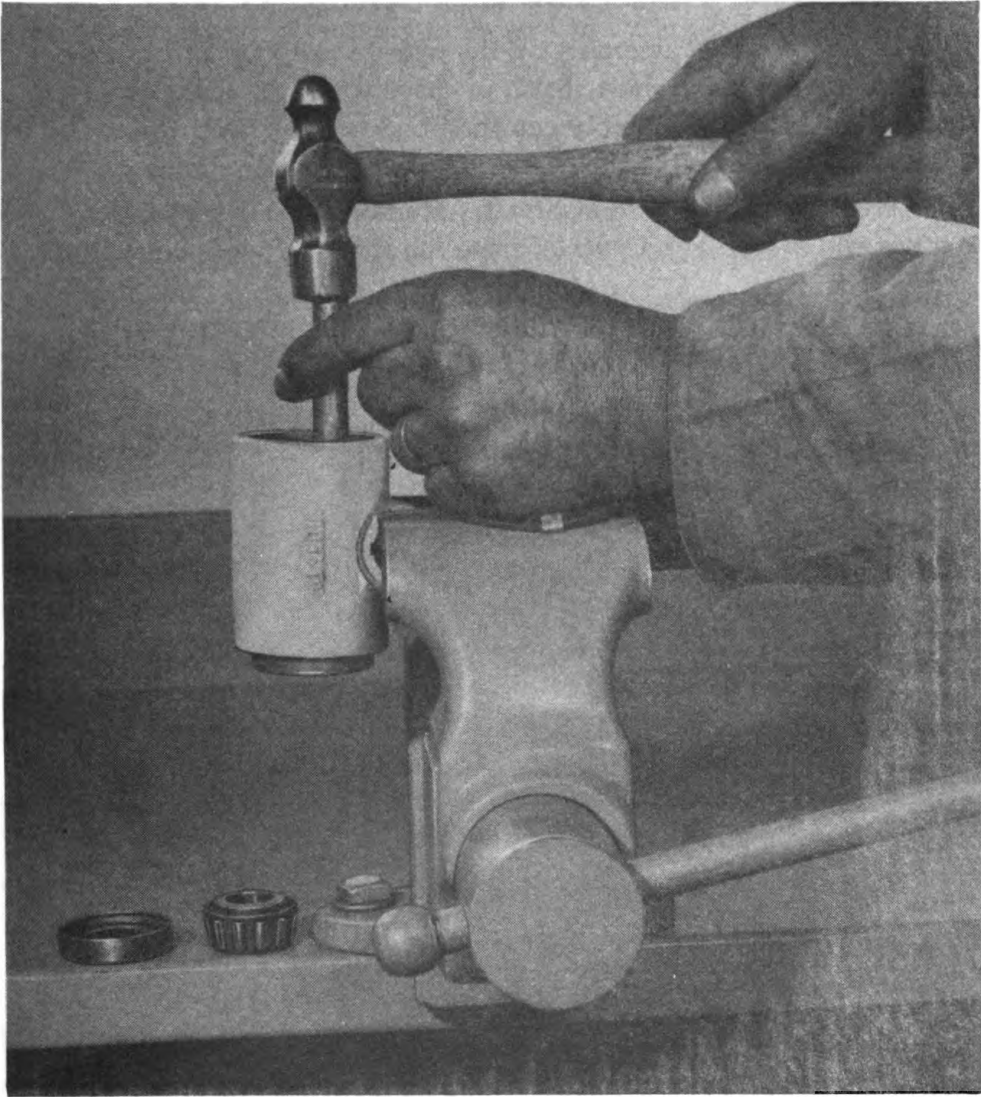


RA PD 67080

Figure 114—Bogie Wheel Removal

wheel support arm. Two bogie wheels are mounted on either end of this arm. The upper end of the yoke anchors a bogie spring support arm, which fastens on the upper end to a bracket on the hull. Two bogie wheels are mounted on a single shaft extending through the bogie wheel support housing, which fastens to the bogie wheel support arm (fig. 113).

BOGIE WHEEL ASSEMBLY AND SUSPENSION



RA PD 67171

Figure 115—Removing Bogie Wheel Support Housing Bearing Cone and Seal

99. REMOVAL OF BOGIE WHEEL ASSEMBLIES.

a. **Remove Bogie Wheel Assemblies.** Place a suitable-sized block of wood through upper half of bogie spring support yoke extending along top of spring leaf. Place a jack on track plates and under block. Raise jack until bogie wheels clear the track. Remove T-lock and pivot bolt holding bogie wheel support arm to bogie spring support yoke. Tilt the assembly and remove from vehicle.

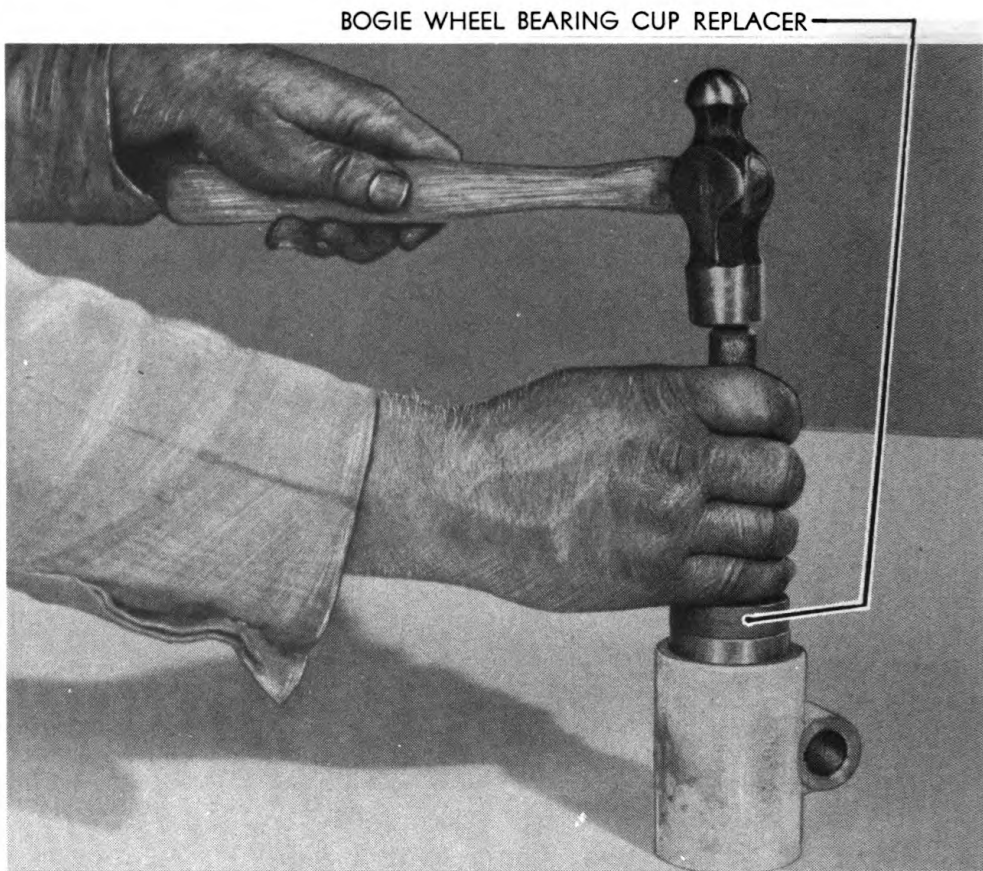
100. DISASSEMBLY OF BOGIE WHEEL ASSEMBLY.

a. **Remove Bogie Wheel.** Place the center of the bogie wheel support arm in a vise, remove the cotter pin and nut from one wheel shaft.

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Pull or drive the wheel assembly off the wheel shaft (fig. 114), remove the Woodruff key from the shaft. Push or drive the shaft assembly from the housing. The bearing assembly can then be removed from the wheel with a brass drift. Disassemble the other wheel in the same manner.

b. Remove Bogie Wheel Shaft. Remove cotter pin and nut from the other end of shaft, and pull or drive the shaft through wheel hub.



RA PD 67141

**Figure 116—Installing Bearing Cup in Bogie
Wheel Support Housing**

c. Remove Bearings. Remove the tapered roller bearings and grease seals from each end of the housing (fig. 115).

d. Removal of Bogie Wheel Support Housing. Take out the cotter pin, remove the nut from the machined end of the support arm, and pull off the housing.

101. CLEANING OF BOGIE WHEEL ASSEMBLY PARTS.

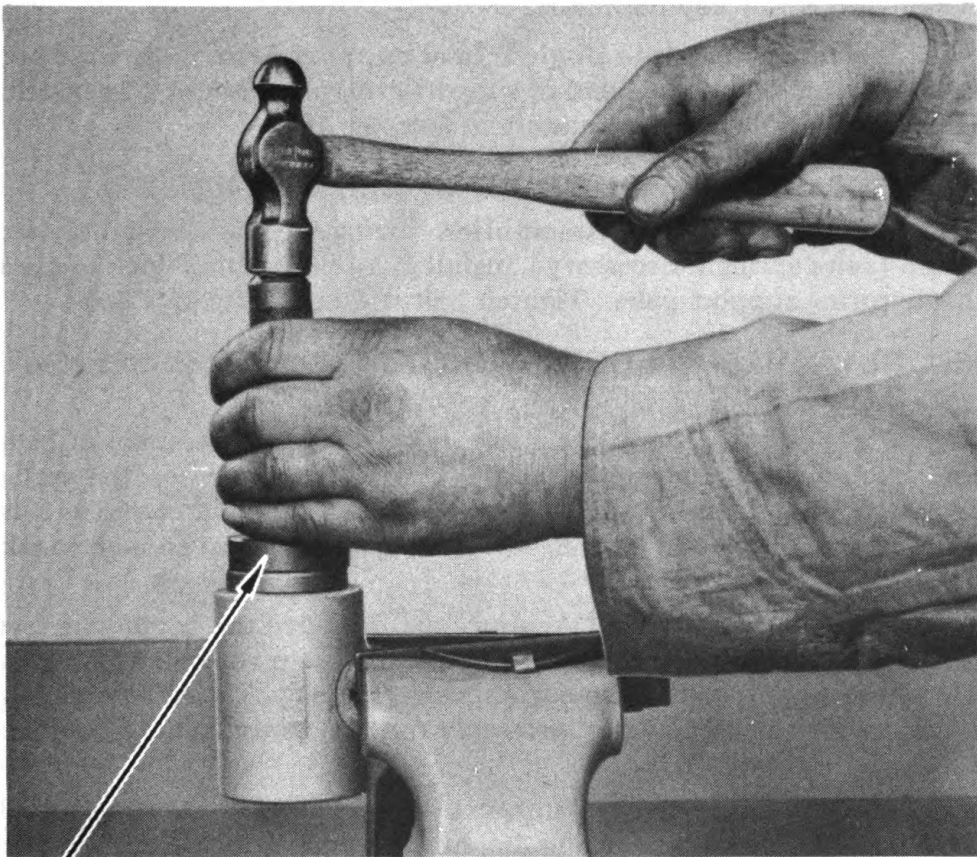
a. Clean all parts carefully with SOLVENT, dry-cleaning, allowing the bearing cones to remain in the solvent long enough to soak thoroughly.

BOGIE WHEEL ASSEMBLY AND SUSPENSION

Dry with wiping cloths or compressed air. Remove the bearing cones from the solvent and wash thoroughly in the solvent. Blow dry with compressed air, being careful not to direct the air against the side or face of the cone to avoid spinning.

102. INSPECTION AND REPAIR OF BOGIE WHEEL ASSEMBLY PARTS.

a. Examine the parts carefully for breakage or other damage which would render them unfit for further service. If new bushings are needed in the spring eyes, or bracket, drive out the old bushings and install new.



BOGIE WHEEL SUPPORT HOUSING SEAL REPLACER

RA PD 67185

Figure 117—Installing Bogie Wheel Support Housing Seal

If new bushings are not available, replace the assembly. Bogie wheel bearing cups and cones found to be scored or otherwise damaged must be replaced (fig. 116). New grease seals must also be installed (fig. 117). Smooth down any burrs detected on the spring yoke pins or pivot bolt. Install a new spring when damaged or when broken spring levers are found. Replace any bent bogie spring support arms. Rerivet or replace any loose rivets in the wheel.

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103. ASSEMBLY OF BOGIE WHEEL COMPONENTS.

a. **Assembly of Bogie Wheel to Housing.** With new grease seals and new bearings assembled to the housing and properly lubricated, insert the shaft through one wheel, place the Woodruff key in the shaft and slide the wheel into position with the key entering the groove in the wheel. Install the nut on the end of the shaft; do not install cotter key. Slip shaft through the housing. Place Woodruff key in position on other end of shaft, slip wheel over, so that key enters keyway in wheel, install nut and tighten both nuts until wheels become difficult to turn. Back nuts off until wheels will spin and cotter key both nuts.

b. **Assemble Wheels to Bogie Wheel Support Arm.** Lubricate both housing bore and machined end of support arm, place housing in position and install nut. Tighten moderately and cotter key.

104. INSTALLATION OF BOGIE WHEEL ASSEMBLIES.

a. **Install Bogie Wheel Assemblies.** Swing the wheel assembly into position (raise spring if necessary), install pivot bolt, with T-lock in place, in bogie spring support yoke. Tighten bolt and bend ears of T-lock.

105. REMOVAL OF BOGIE WHEEL ASSEMBLY SUSPENSION PARTS.

a. While not absolutely necessary, it will facilitate removal of bogie wheel assembly suspension parts if the tension is relieved on the spring. This can be accomplished by placing a jack on the track plates and as close to the end of the spring as possible and raising the jack just enough to take the tension off the spring.

b. **Remove Bogie Wheel Assemblies.** Remove the bogie wheel assemblies by loosening the T-lock and removing the pivot bolt holding the bogie wheel support arm to the bogie spring support yoke. After removing the bolt, swing the bogie wheel assembly out and away from the support bracket.

c. **Remove Bogie Spring Support Arms.** Loosen the shackle bolt T-lock, and remove shackle bolt holding support arm to hull bracket. Loosen T-lock, and remove shackle bolt holding support arm to bogie spring support yoke.

d. **Remove Spring Support Yoke.** Loosen T-lock, and take out shackle bolt holding support yoke to transverse spring eye.

e. **Remove Transverse Spring.** Remove nuts and lock washers holding spring retaining plate to bottom of hull. Remove spring.

106. CLEANING OF BOGIE WHEEL ASSEMBLY SUSPENSION PARTS.

a. Clean all removed parts with SOLVENT, dry-cleaning, and dry thoroughly. Examine for damaged or broken parts. Relubricate all parts before reassembly.

BOGIE WHEEL ASSEMBLY AND SUSPENSION

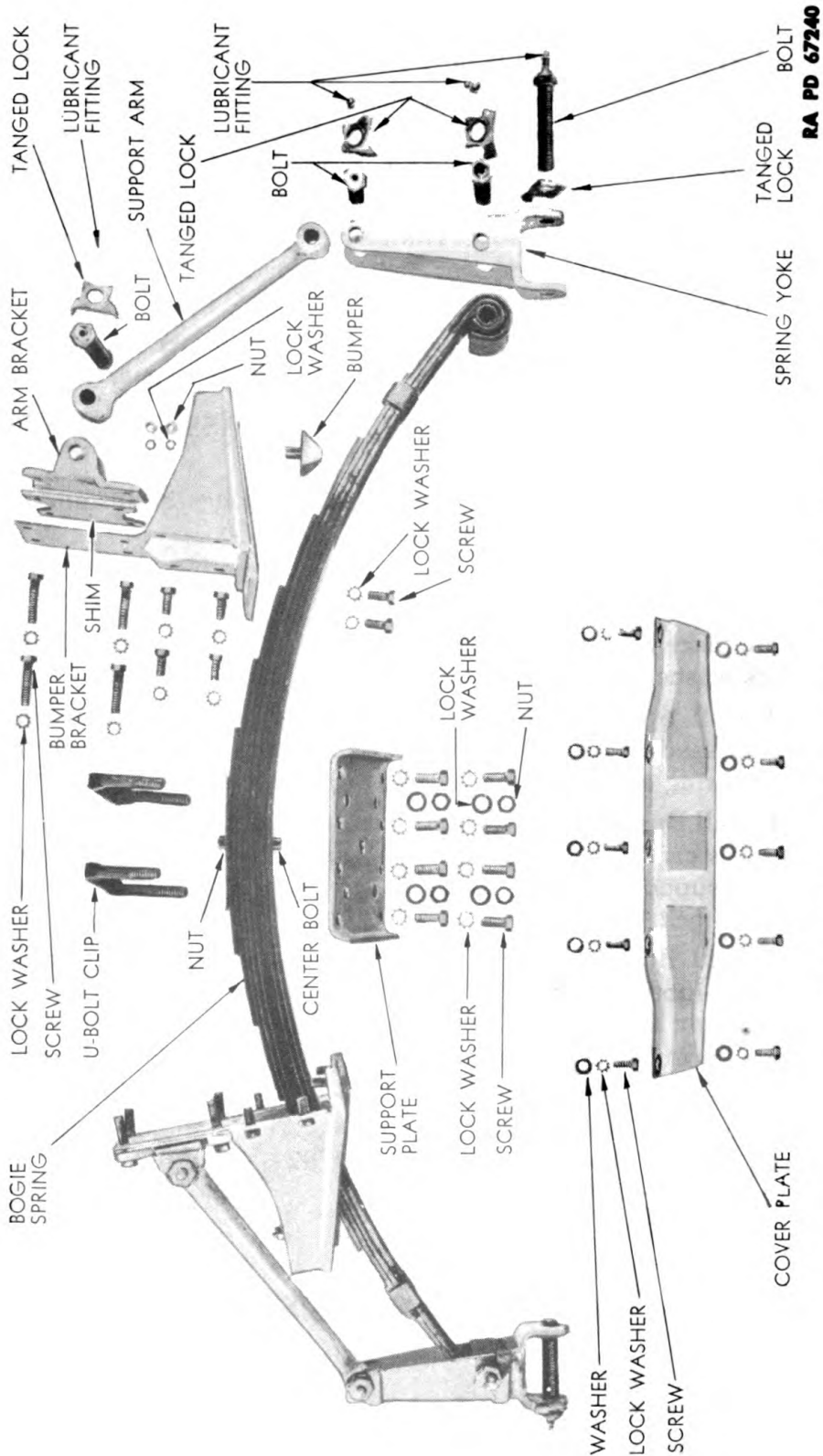


Figure 118—Bogie Suspension Parts

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107. INSPECTION AND REPAIR OF SUSPENSION PARTS.

a. **Support Arms** (fig. 118). Inspect arms for evidence of distortion, misalignment and breaks or cracks. Make certain that the support arm bracket bolt threads are not stripped or damaged. If threads are not clean and in good condition, retap them.

b. **Bogie Spring Support Yoke** (fig. 118). Inspect the yoke for cracks or distortion. Examine shackle bolt threads and if stripped or damaged retap or, if necessary, replace.

c. **Springs** (fig. 118). Inspect springs for broken leaves and rust. Make certain leaf movement is free and springs are properly lubricated.

108. INSTALLATION OF BOGIE WHEEL ASSEMBLY SUSPENSION PARTS.

a. **Install Springs.** It is important that springs be installed in the correct location, which is as follows:

Front spring: 11 leaves

Rear spring: 13 leaves

Front center spring: 9 leaves

Rear center spring: 9 leaves

To install, place lubricated spring in position under hull, install retaining plate, lock washers on bolts, install nuts and tighten securely.

b. **Install Spring Yokes.** Place yoke in position on spring, place T-lock over shackle bolt, lubricate bolt and spring eye, install bolt through yoke and spring eye, tighten and lock with T-lock.

c. **Install Bogie Wheel Assemblies.** With outer end of spring jacked up so wheels can be placed in position, line up bolt hole in support yoke with hole in support arm and install pivot bolt with lock. Tighten and lock bolt with T-lock.

d. **Install Bogie Support Arms.** Place support arm in position in hull bracket, lubricate support arm eye, and shackle bolt. Place T-lock in position on bolt, install bolt, tighten and lock with T-lock. Position support yoke end of arm, lubricate support arm eye and bolt, place T-lock on bolt, install bolt, tighten and lock with T-lock.

e. **Check and Adjust Track Tension.** Check and, if necessary, adjust track tension as outlined in paragraph 92.

Section VI

GUIDE WHEEL ASSEMBLY

	Paragraph
Description	109
Removal of guide wheel assembly	110
Cleaning of guide wheel assembly	111
Inspection and repair of guide wheel assembly	112
Installation of guide wheel assembly	113

GUIDE WHEEL ASSEMBLY

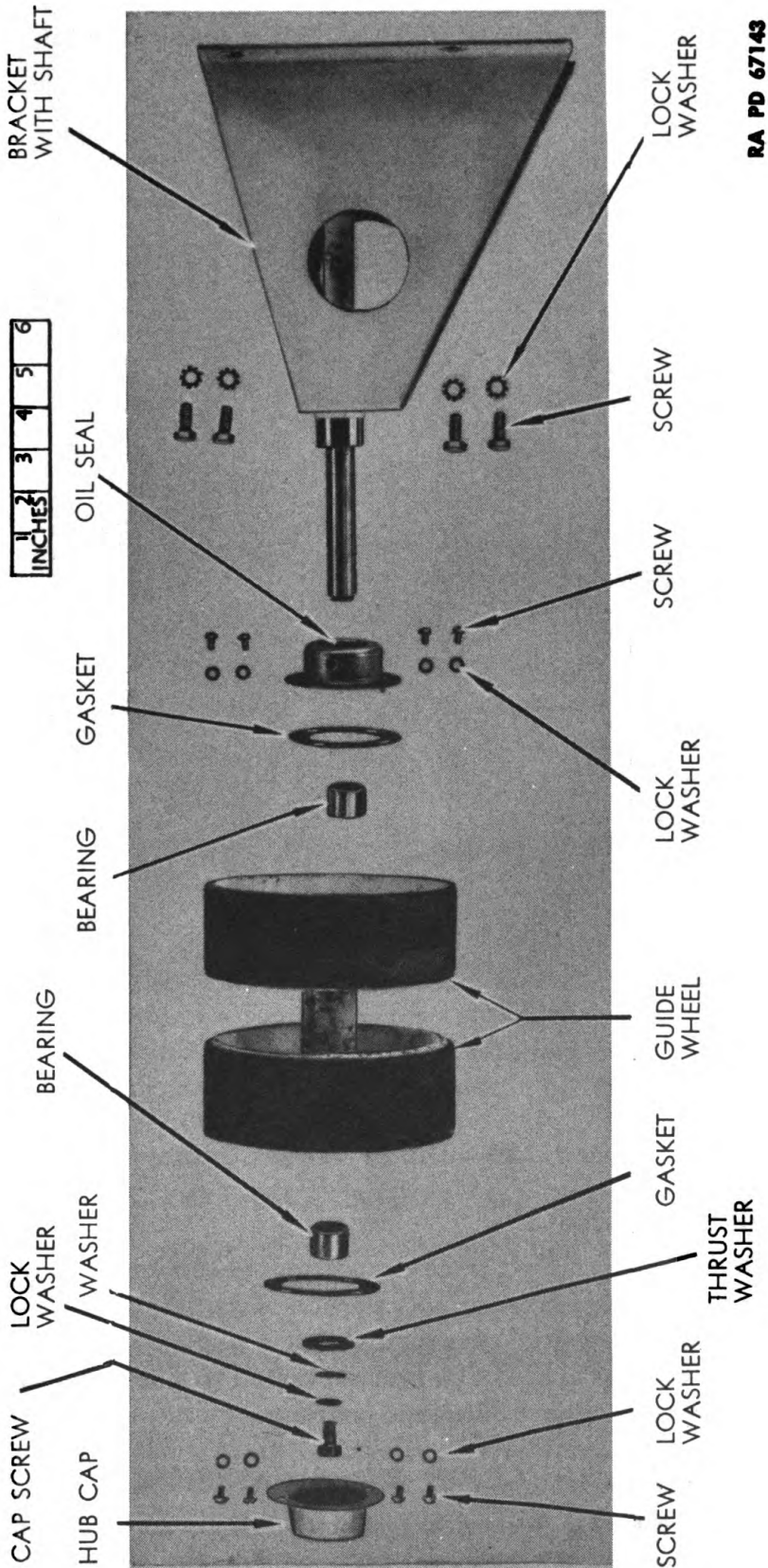
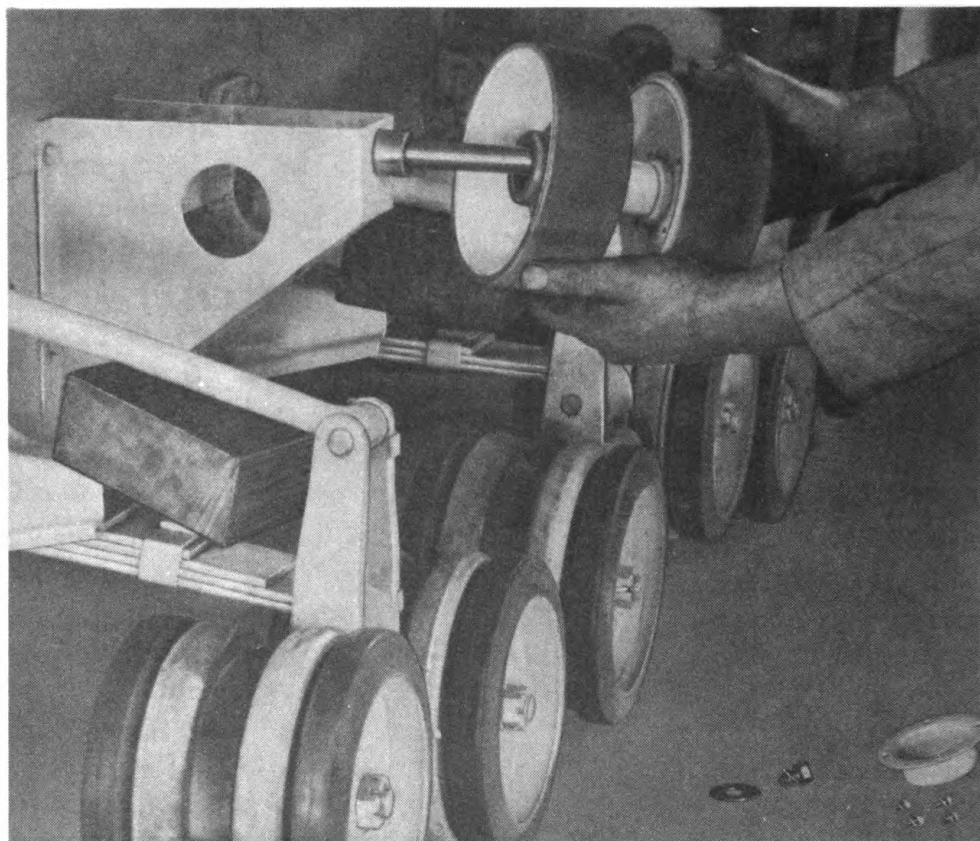


Figure 119—Guide Wheel, Bearings, and Bracket

**ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
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RA PD 67102

Figure 120—Guide Wheel Removal

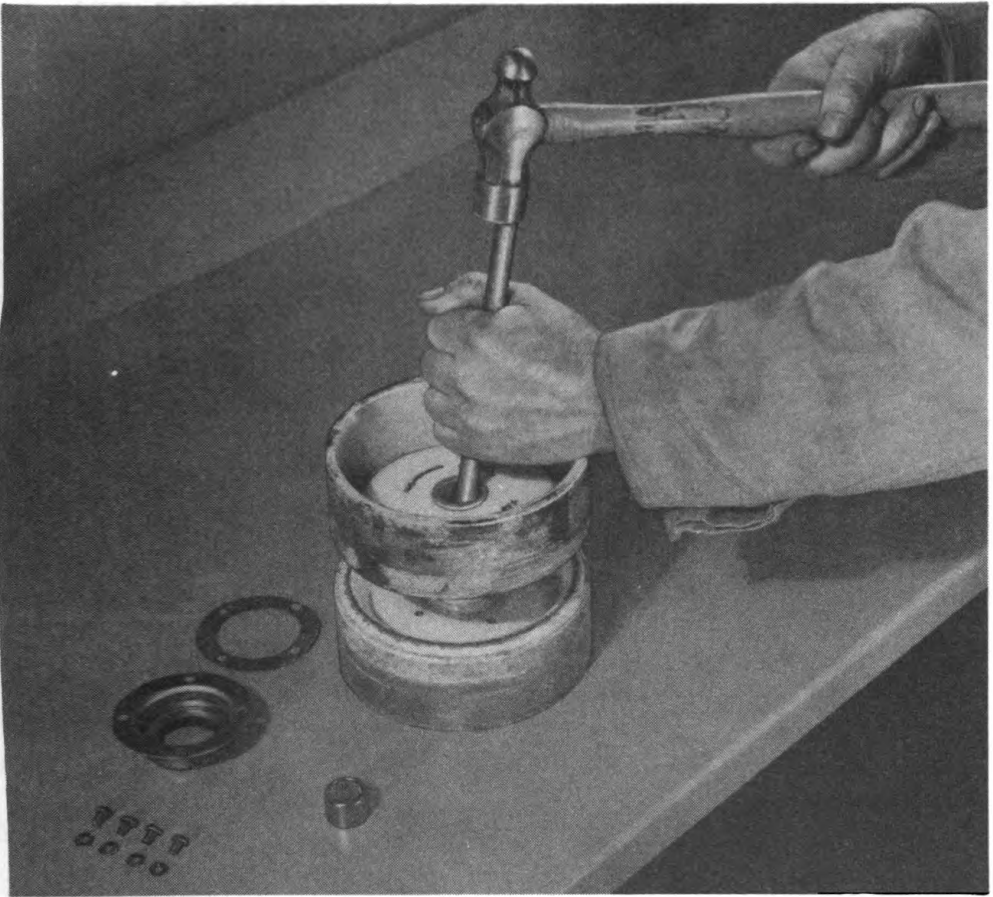
109. DESCRIPTION.

a. **Description.** Two track-supporting wheels on each side of the vehicle guide and support the upper portion of the track. Each wheel consists of two rubber-covered rims mounted on a single hub. The wheels are carried on a spindle welded to a bracket bolted to side of hub (fig. 119). Each wheel runs on two needle-type bearings.

110. REMOVAL OF GUIDE WHEEL ASSEMBLY.

a. **Remove Guide Wheel Assembly.** Before the guide wheels can be removed it will be necessary to either relieve the track tension, or else block the track up in some manner so that its entire weight is not resting

GUIDE WHEEL ASSEMBLY



RA PD 66916

Figure 121—Guide Wheel Bearings Removal

on the wheel. Take out the four hub screws with lock washers, and remove the hub cap and gasket. Remove the wheel retaining screw, lock, flat and thrust washers. Pull the guide wheel with needle bearings and oil seal off the spindle (fig. 120).

111. CLEANING OF GUIDE WHEEL ASSEMBLY.

a. Clean the wheels of any accumulation of mud or debris. Clean all old lubricant from needle bearings, and repack with fresh lubricant.

112. INSPECTION AND REPAIR OF GUIDE WHEEL ASSEMBLY.

a. Remove the inner oil seal cap and gasket by taking out the screws holding the cap to the hub. If the bearings show signs of damage, remove them with a brass drift (fig. 121). If new bearings are to be installed, use a replacer KM-J3613 to install them in place in the guide wheel hub (fig. 122). A new inner cap oil seal assembly and gasket should be used. Smooth off any burrs found on the shaft. If inspection reveals the wheel

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NEEDLE BEARINGS REPLACER KM-J3613

RA PD 67190

Figure 122—Guide Wheel Bearings Installation

support bracket and shaft are damaged and unfit for further service, a new support bracket should be installed.

113. INSTALLATION OF GUIDE WHEEL ASSEMBLY.

a. Pack the wheel bearings with No. 0 grease. Install the inner oil seal and cap and gasket assembly on the hub, slip the wheel on the spindle, place the spacer washer on the cap screw, install and tighten the screw. Use a new gasket and install the hub cap.

CHAPTER 5

HULL AND HULL ELECTRICAL SYSTEM

Section I

HULL

	Paragraph
Description and data.....	114
Trouble shooting	115
Hull	116
Top and bows.....	117
Seat assemblies	118
Engine compartment lid and side panel.....	119
Air duct, ventilator lid, and control.....	120
Muffler guard.....	121
Windshield and brackets.....	122
Windshield defroster.....	123
Brush guard.....	124
Miscellaneous brackets, hooks, handles, loops, straps, covers, drains and pintle hook.....	125

114. DESCRIPTION AND DATA.

a. Description (figs. 123 and 124). The hull is constructed of 18-gage sheet metal, electrically welded. The interior is divided into two compartments by a permanent bulkhead. The engine, cooling system, fuel tank, electrical system, and their related parts and driver's vehicle controls are located in the forward compartment. The rear compartment houses the radio equipment, has seating capacity for three passengers, and is also used for cargo storage. A floor pan in the rear compartment covers the propeller shaft, transmission and axle driving unit and is removable to permit servicing. Five drain plugs are located on the left side of the hull, one on the right side, and a drain plate on the bottom of the hull below the engine oil drain plug.

b. Data.

Weight of vehicle with oil, fuel, and water.....	3725 lb
Over-all length	125 1/4 in.
Over-all width.....	60 in.
Over-all height (ground to top of windshield).....	70 5/8 in.
Over-all height (top and windshield folded)	51 in.
Ground clearance	11 in.
Turning circle (approximately)	24 ft
Unit pressure (5-in. show penetration).....	1.75 lb psi

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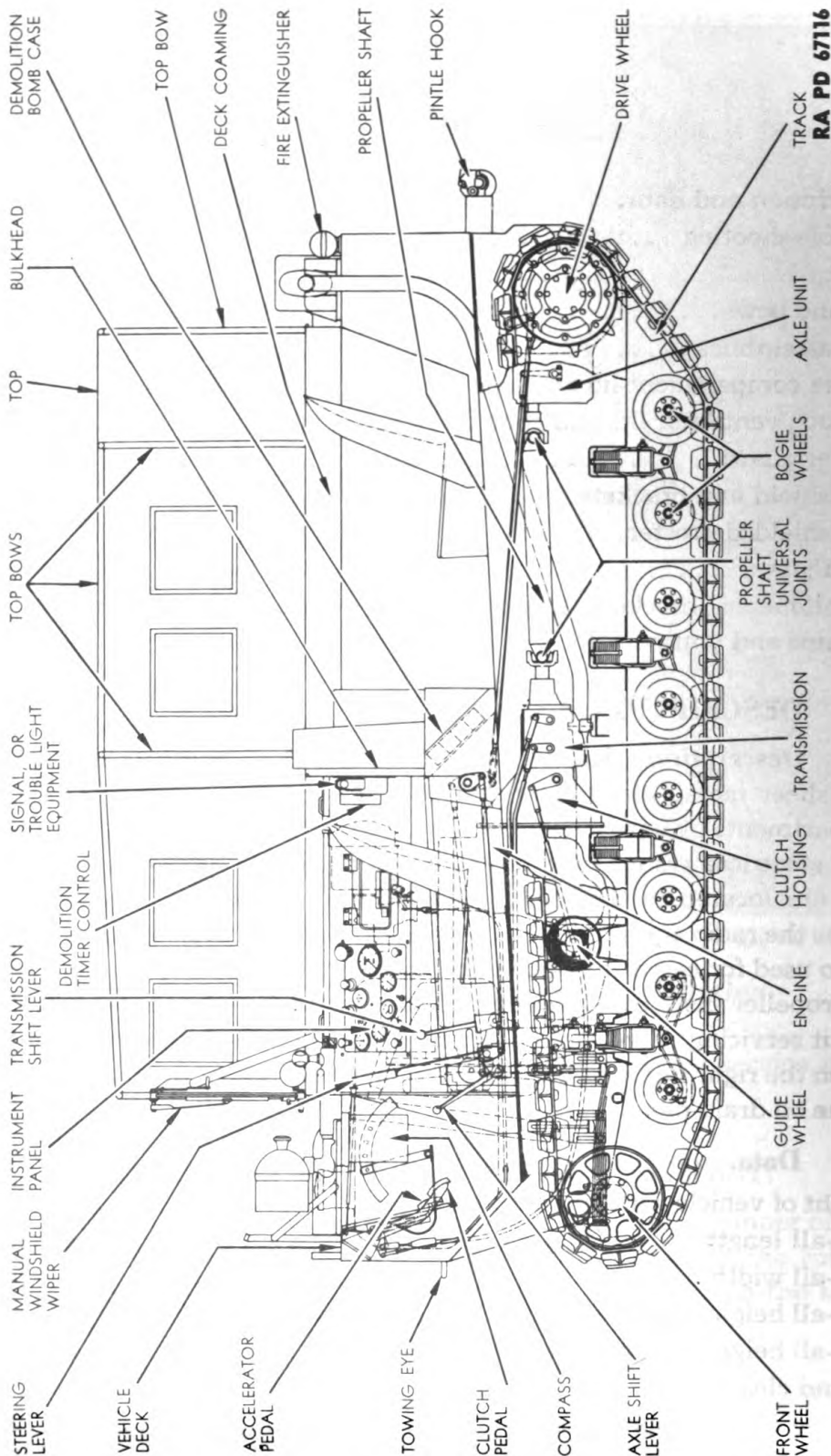
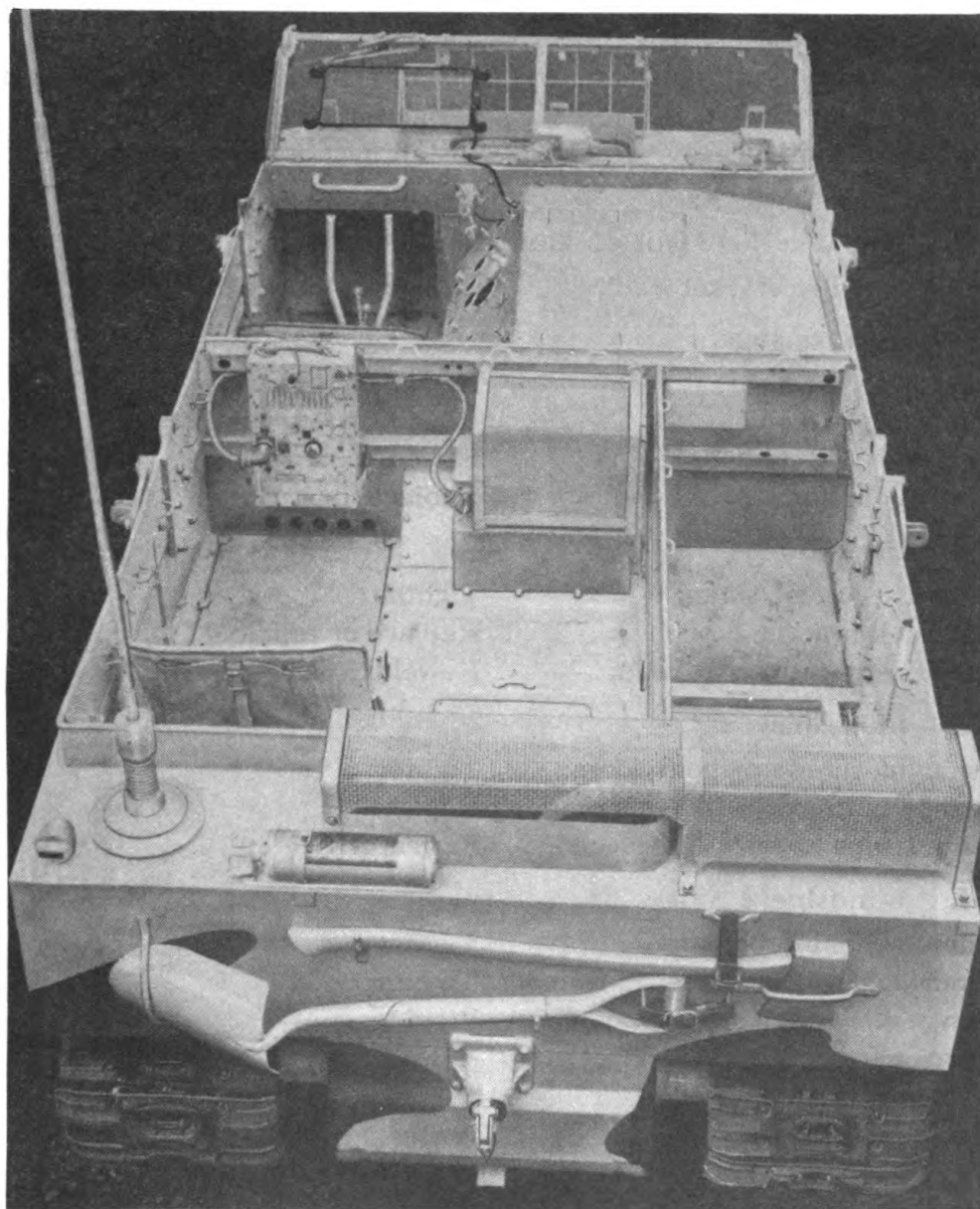


Figure 123—Light Cargo Carrier T24—Longitudinal Section

RA PD 67116

HULL



RA PD 67017

Figure 124—Light Cargo Carrier T24 Rear

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115. TROUBLE SHOOTING.**a. Hull Leakage.**

Possible Cause	Possible Remedy
Holes in bottom of hull.	Weld.
Drain plugs loose.	Tighten.
Leakage at axle shaft flange.	Install new flange at hull gasket or tighten flange bolt nuts.
Starting crank hole cover leaking or missing.	Install new or tighten.

b. Hull Brackets Out of Alinement.

Hull cracked at bracket weld.	Straighten or weld.
-------------------------------	---------------------

c. Top Leakage.

Top torn.	Repair or replace.
Top worn excessively.	Repair or replace.
Top insecurely lashed.	Fasten securely.
Windows broken.	Replace.

d. Seats Noisy.

Seats insecurely fastened.	Tighten.
Seat back bracket broken.	Replace or repair.
Seat bottom broken at weld.	Reweld.

e. Lids Noisy.

Fastening screws or bolts loose.	Tighten.
Fastening screws or bolts missing.	Replace.
Cargo straps loose or unfastened.	Fasten or tighten.

f. Windshield Noisy.

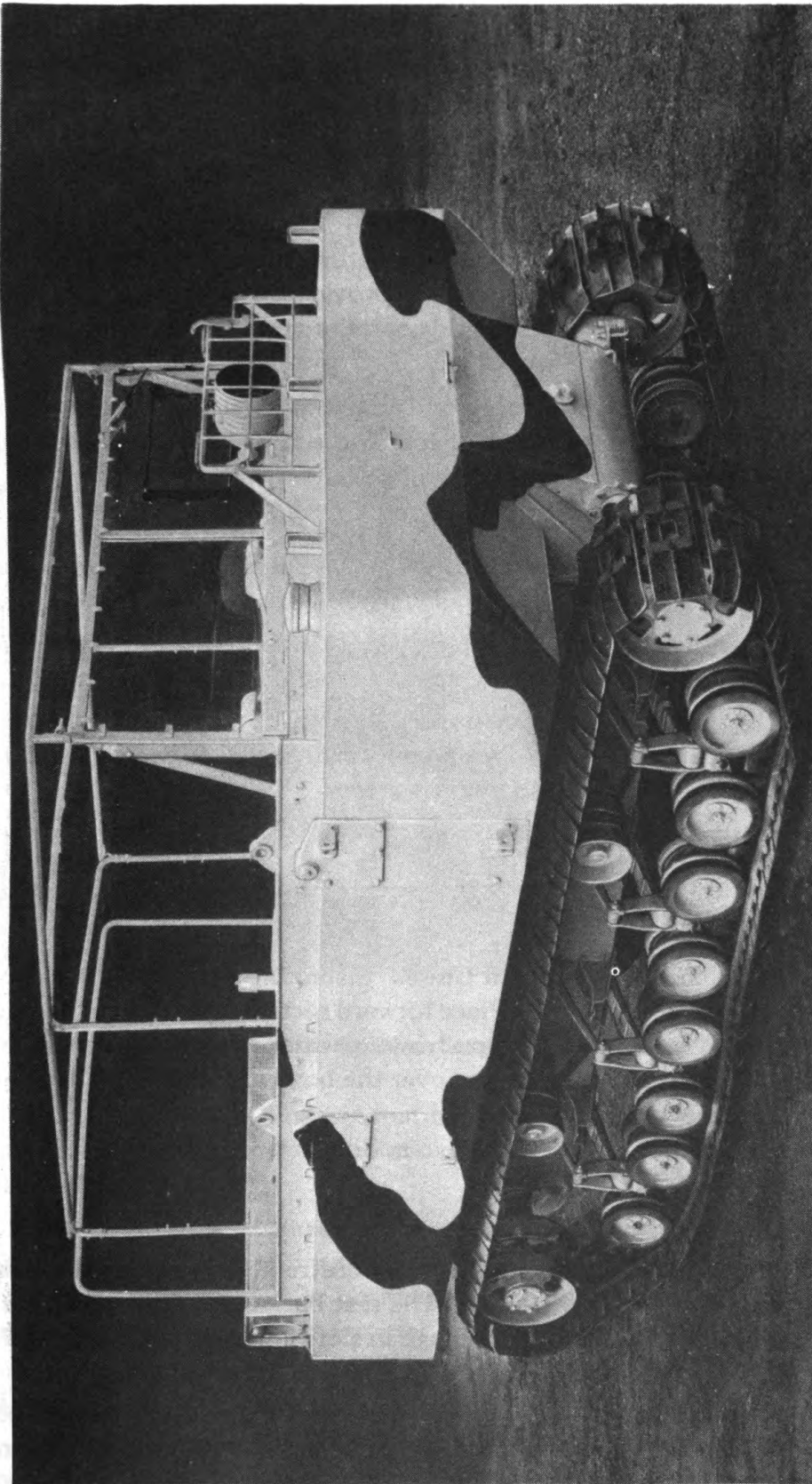
Frame fastening bolts loose.	Tighten.
Windshield wipers loose on frame.	Tighten.
Frame cracked or body coaming broken.	Weld.

116. HULL.

a. Cleaning of Hull. Clean the hull both externally and internally with water under pressure. More satisfactory results will be obtained if hot water is used.

b. Inspection and Repair. A careful inspection should be made of the hull for cracks or tears which might cause water leakage. Examine the bogie assembly support brackets and upper track guide wheel brackets for alinement and breaks. If cracks or tears are discovered, they should be welded and straightened. Repairs to the hull will consist primarily of

HULL



RA PD 67016

Figure 125—Light Cargo Carrier T24—Less Top and Antenna

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welding breaks, holes or cracks, and of straightening bent outriggers or guide wheel brackets by heating and alining.

117. TOP AND BOWS.

a. Description.

(1) **TOP.** The top, side curtains and rear curtain is constructed of heavy duck material. All curtains are provided with windows. A flexible steel cable is used to lash the top, side curtains and rear curtain to fasteners on the hull coaming and windshield.

(2) **BOWS.** The bows are constructed of steel tubing, divided into four sections and bent to proper shape. Bows are held in position by wing nuts at the windshield and in the hull sockets by cotter pins.

b. Removal of Top and Bows.

(1) **REMOVAL OF TOP** (fig. 125). Remove all lashings from attaching buttons on hull coaming and windshield. Remove top and side curtains.

(2) **REMOVAL OF BOWS.** Remove all cotter pins from bow sockets, loosen wing nuts at windshield upper bar, and lift bows from vehicles.

c. Cleaning of Top. Grease, oil, etc., can be removed from the material by washing with a mild soap and warm water. Clean side and rear windows with mild soap and warm water.

d. Inspection and Repair. To repair a torn top, a suitable piece of material should be stitched in place, covered with waterproofing compound and properly painted. Bows that are bent should be straightened. If cracked, reweld or replace.

e. Installation of Top and Bows. Install the top bows in their sockets and install the cotter pins. Place forward section of bows over the studs at the top of windshield bar, pull into position and tighten wing nuts securely. Place the top in position over the bows and lash it in place with the flexible steel cable.

118. SEAT ASSEMBLIES.

a. Description.

(1) **SEAT BACKS.** Seat backs are constructed of tubing and sheet metal and are adequately padded. The seat backs are held in position by ears at the lower section which engage in slots in hull floor. They are fastened by spring hooks.

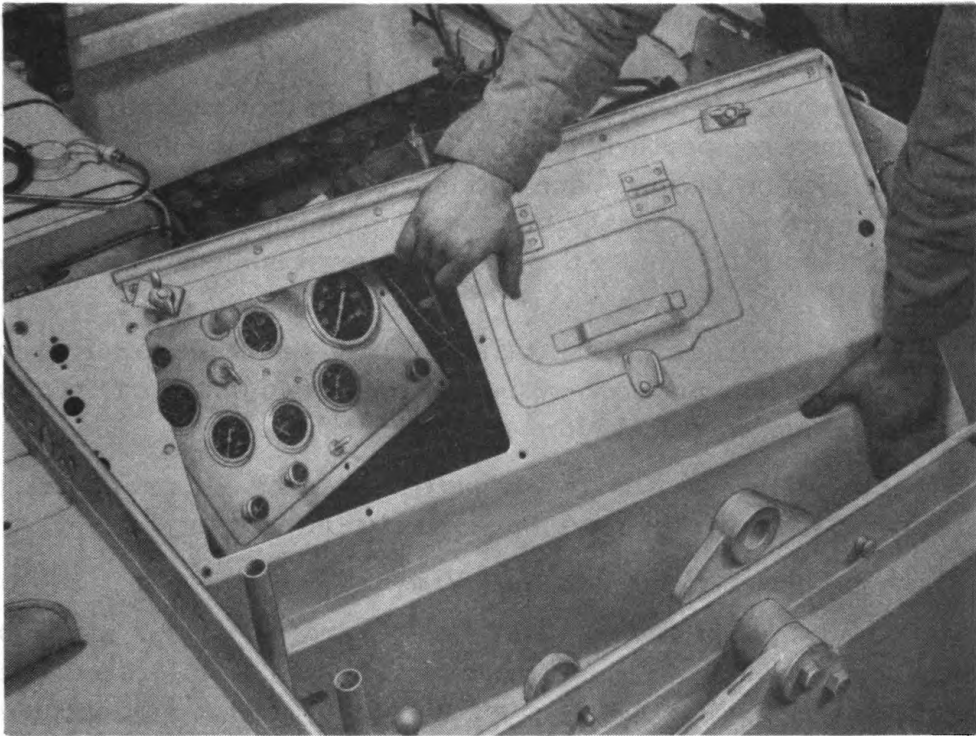
(2) **SEAT CUSHIONS.** Seat cushions are included and are held in position on hull floor by web straps integral with the cushion, and two snap fasteners.

HULL

b. Removal of Seats. To remove seat backs, unfasten seat back hook, tip forward and pull ears out of slots in hull floor and remove from vehicle. Unfasten web hold-down strap button on hull floor and remove cushion from vehicle.

c. Inspection and Repair.

(1) **SEAT CUSHIONS.** Inspect cushions for dirt, grease, etc., and if dirty, wash with a solution of warm water and soap. Note condition of hold-down straps, and if torn or frayed, repair or replace as necessary.



RA PD 67097

Figure 126—Engine Compartment Side Panel Removal

(2) **SEAT BACKS.** Inspect seat back for cracks or breaks in welding, condition of padding and condition of ears on lower section. Repair or replace as necessary.

d. Installation of Seats. Tip seats forward and engage seat back ears in hull floor stops and tip back to lock. Fasten spring hook to back of seat. Place seat cushion in position on hull floor. Slip web hold-down strap under eyelet and over fastener button on hull floor.

119. ENGINE COMPARTMENT LID AND SIDE PANEL.

a. Description. Two lids are provided for the engine compartment; one is located directly over the engine and is removable to provide for

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engine removal or adjustments. A small lid, located on the instrument panel, will permit minor adjustments to be made to the engine left side.

b. Removal of Engine Compartment Lid and Side Panel.

(1) **REMOVE ENGINE COMPARTMENT LID.** Loosen the two large wing nuts, raise the lid until tongues on lid are released from slots on right side of hull coaming, and remove lid from vehicle. Disconnect ground cable from battery terminal. Disconnect primer inlet and outlet pipe coupling nuts and instrument panel to engine compartment side panel. Move panel inward and lay it on the engine.

(2) **REMOVE SIDE PANEL.** Remove spotlight connection from upper socket. Remove compass light cable from lower socket. Remove wire harness from clips on back of panel. Remove the cap screws holding the engine compartment panel in position, remove the cap screws holding rear cross shaft cover, and remove the cross shaft cover and engine side panel (fig. 126).

(3) **REMOVE ENGINE COMPARTMENT INSPECTION DOOR.** Remove attaching bolts, nuts and lock washers from the two hinges and remove the door and hinge assembly from the engine side panel.

c. Inspection and Repair. Inspect the lids, hinges and fastenings for damage, and repair by rewelding or replace if necessary.

d. Installation of Lid and Side Panel.

(1) **INSTALL ENGINE COMPARTMENT INSPECTION DOOR AND SIDE PANEL.** Install hinges to side panel, insert bolts, lock washers and nuts. Tighten securely. Install engine compartment side panel in position, fasten securely, using proper cap screws. Install rear cross shaft cover in position and fasten securely with cap screws. Connect primer inlet and outlet pipes at couplings. Install spotlight connection at upper socket and compass light connections at lower socket. Replace wire harness in clips back of instrument panel, close clips.

(2) **INSTALL ENGINE COMPARTMENT LID.** Install engine compartment lid by first inserting tongues on lid in the slots right side of hull coaming. Lower lid in position and fasten securely by tightening the two large wing nuts.

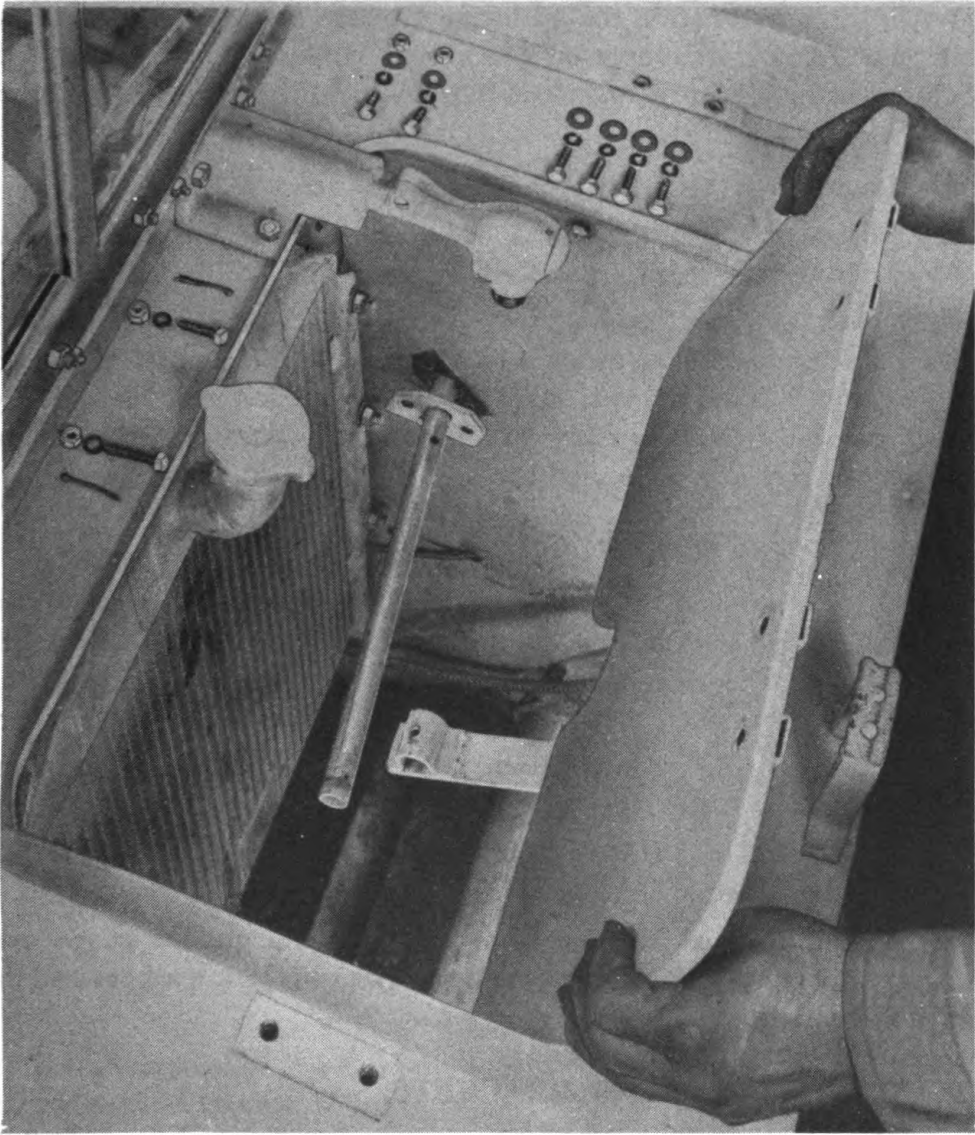
120. AIR DUCT, VENTILATOR LID, AND CONTROL.

a. Description. An air duct is provided at the front of the vehicle to permit air to flow to the cooling system radiator. A manually operated lid located in the air duct is hinged to the hull coaming and operated by a lever, attached to the hull at the right side of the operator.

HULL

b. Removal of Ventilator Lid and Control.

(1) **REMOVE VENTILATOR LID.** Remove the cap screws and lock washers at the two hinges in the lid, and take out the pin holding the lid to the operating arm. Remove lid (fig. 127).



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Figure 127—Air Duct Ventilator Lid Removal

(2) **REMOVE VENTILATOR LID CONTROL.** Remove the bolt, nut and washer from the lid operating arm. Remove the bolt and nut from the bracket holding the left side of the cross shaft to the hull. Remove the cotter pin from the right end of the cross shaft and slide the lever assembly to the left through the driver's compartment, far enough to disengage the operating arm. Remove the two bolts on the cross shaft flange bracket,

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remove the cotter pin from the cross shaft on the left side, remove the cross shaft from the vehicle.

c. Inspection and Repair. If the air duct lid has been bent, it should be reshaped or replaced; if the lid lifting arm has been bent, it should be examined for cracks and replaced if necessary. All linkage and control rods should be straightened or replaced. The control linkage should be lubricated for ease of operation.

d. Installation of Ventilator Lid and Control.

(1) **INSTALL AIR DUCT LID.** Place lid in position. Insert cap screws and lock washers through hinges, and tighten securely.

(2) **INSTALL LID CONTROL.** Slip cross shaft into air duct, through left side bracket and lid operating arm. Place cotter pin in cross shaft right end. Install two bolts to cross shaft left flange bracket, tighten securely. Install operating lever assembly on left end of cross shaft, install lifting arm, bolt and nut, and tighten securely.

121. MUFFLER GUARD.

a. Description. The muffler guard is constructed of heavy mesh screen and welded to three support brackets. The guard is so shaped as to provide complete enclosures for the muffler, exhaust pipe and rear air duct. It is held in position by cap screws, flat washers and lock washers.

b. Removal of Muffler Guard. Remove the six cap screws, lock washers and flat washers, and remove guard from hull (fig. 128).

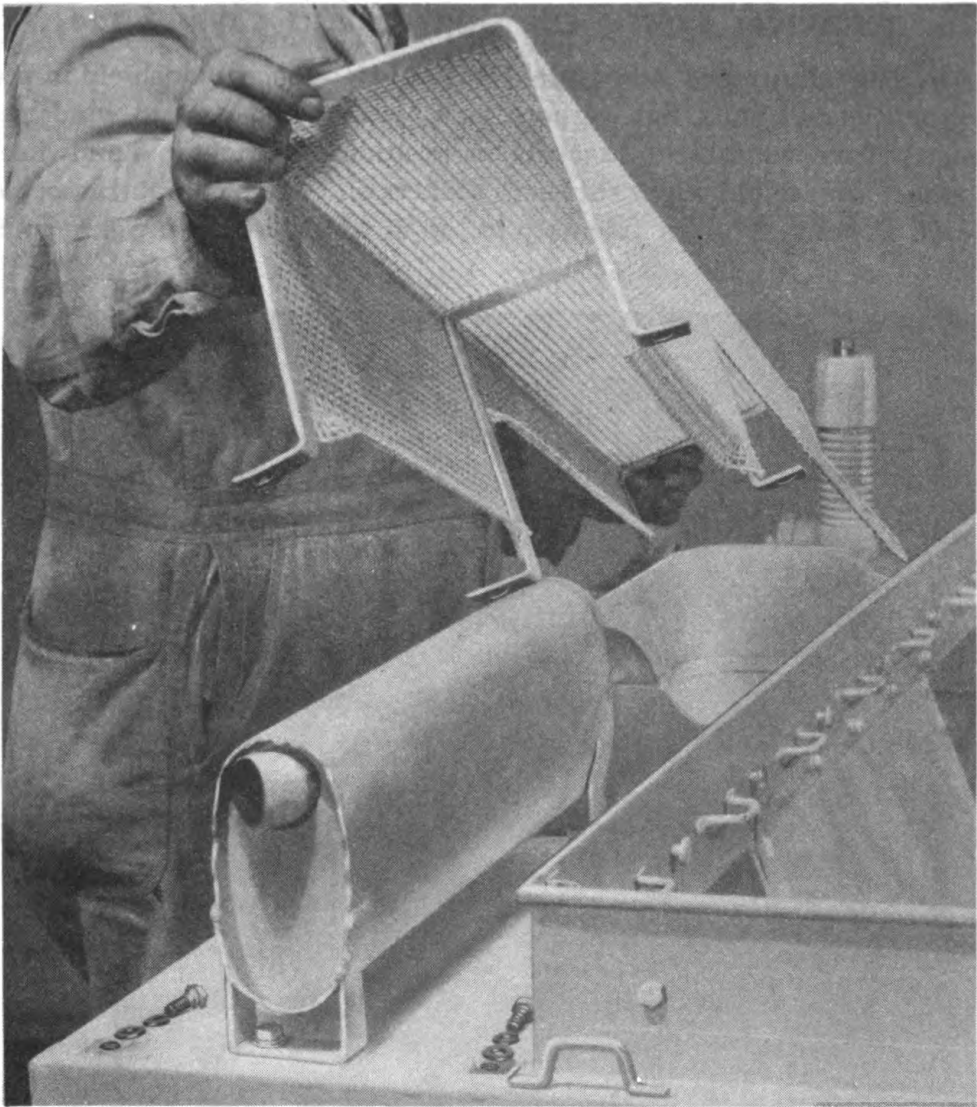
c. Inspection and Repair. Inspect the muffler guard screen and brackets if damaged or bent, reshape or replace with a new unit.

d. Installation of Muffler Guard. Place the muffler guard over muffler and rear air duct. Insert the cap screws with lock washers and flat washers, and tighten securely.

122. WINDSHIELD AND BRACKETS.

a. Description. The windshield is composed of two sections of safety glass and held in a steel frame, divided in the center. The windshield frame is hinged at the bottom. This allows the windshield to be lowered in a forward position and lie on padded brackets provided at the radiator air duct guard. Three windshield wipers are provided—two independent electric wipers and one manually operated wiper located directly in front of the operator. The windshield is also equipped with sockets to which the top bows are attached. An electric windshield defroster operated by a switch on the defroster frame is supplied for attachment to the windshield directly in front of the operator.

HULL



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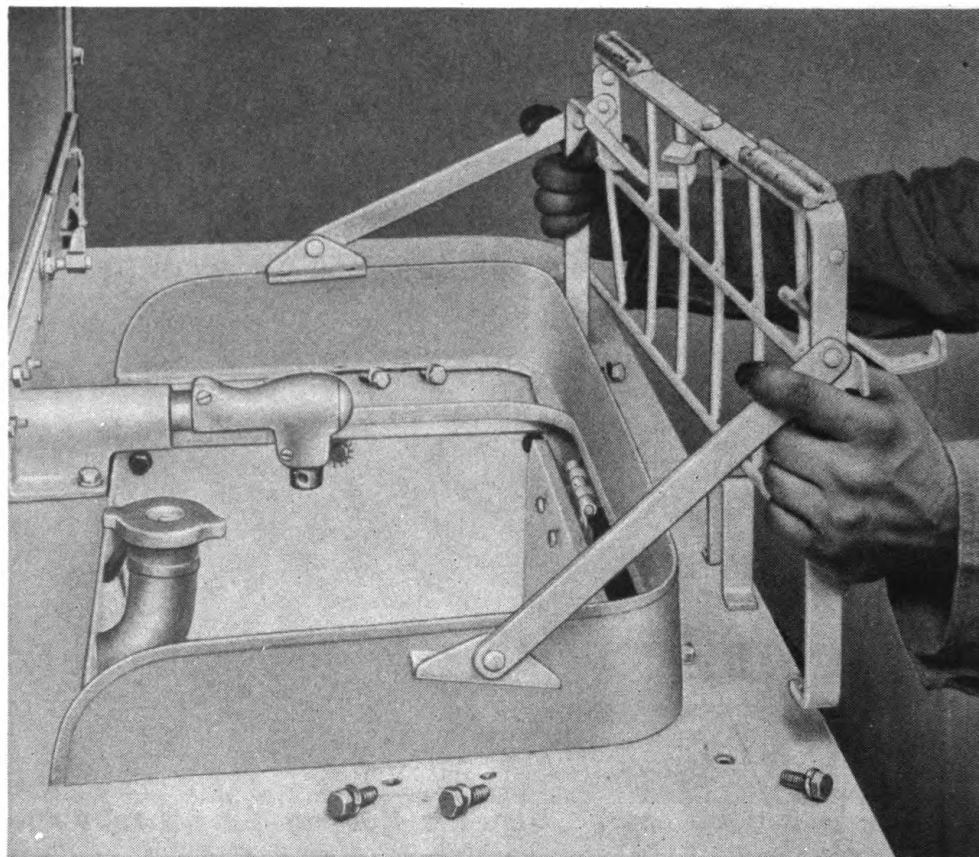
Figure 128—Muffler and Air Duct Guard Removal

b. Removal of Windshield Assembly. Loosen the wing nuts at top of windshield to detach the top bows. Remove windshield wiper cables from connecting sockets on engine compartment side panel. Loosen the two side handwheels and remove brackets from side panel. Remove the nuts, lock washers, flat washers and nuts from windshield hinge and remove windshield from vehicle.

c. Inspection and Repair of Windshield and Brackets. No repair is possible to the windshield frame or glass, new parts must be procured when damage occurs. Inspect windshield bracket. If bent, straighten. Inspect threads on windshield support bracket handwheels; if damaged, cut off with hacksaw, remove and install new handwheel. Upset outer end after installation.

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d. **Installation of Windshield Assembly.** Place windshield in position and install bolts, flat washers, lock washers and nuts to windshield hinge. Place windshield brackets in position and tighten handwheels. Connect windshield wiper cables to sockets on engine compartment side panel. Position top bow assembly to top of windshield and tighten wing nuts.



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Figure 129—Brush Guard Removal

123. WINDSHIELD DEFROSTER.

a. **Description.** An electric windshield defroster is supplied for attachment to the windshield and is located directly in front of the operator. It is operated by a switch on the defroster frame. The unit is fastened to the windshield by the means of four vacuum cups.

124. BRUSH GUARD.

a. **Description.** A guard is provided to reduce the possibility of any damage at the front of the windshield and air duct. It is of grille construction and is attached to hull coaming at air duct opening.

HULL

b. **Removal of Brush Guard.** Remove cap screws, flat washers and lock washers, and remove guard from hull coaming (fig. 129).

c. **Inspection and Repair of Brush Guard.** Inspect guard for cracks in framework, distortion or other damage. Repair or replace as necessary.

d. **Installation of Brush Guard.** Place guard in position on hull coaming, insert cap screws with flat washers and lock washers, tighten securely.

125. MISCELLANEOUS BRACKETS, HOOKS, HANDLES, LOOPS, STRAPS, COVERS, DRAINS AND PINTLE HOOK.

a. **Brackets.** Brackets should be examined for cracks, breaks, and looseness of bolts or rivets.

b. **Hooks.** Inspect hooks for breaks, loose or weak springs, etc., and fastenings. In most cases, if they are damaged, it will be preferable to install a new part rather than attempt repair.

c. **Handles.** Handles should be inspected for breaks and loose fastening bolts or rivets. Install new parts if old ones are broken.

d. **Loops and Straps.** If loops or straps are broken, torn or frayed, install new.

e. **Covers.** The covers referred to are those for guns, spotlight and cargo space inside vehicle. If dirty, clean by washing with mild soap and warm water. Covers torn or otherwise damaged should be replaced.

f. **Drains.** Inspect drain plates and plugs for tightness and proper seals. Make certain that all gaskets are in place and in good condition and properly coated with joint and thread compound.

g. **Pintle Hook.** The pintle hook is located at the rear center of the hull. The hook is spring-loaded to prevent the lunette or towing bar from loosening from the pintle hook proper. The release spring latch should be lubricated as required for freedom of operation.

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Section II

HULL ELECTRICAL SYSTEM

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126. DESCRIPTION AND DATA.

a. Description. The hull electrical system is of the single-wire grounded type and consists of a heavy-duty battery, related wiring, voltmeter, compass and lamp, the several lights on the vehicle, the electric windshield wipers, and related operating switches. Since provision is made for radio installation, adequate grounding is extremely important, and is provided at all points where grounds are necessary. Reference to the face of the instrument panel or gage is predicated on observation from the driver's seat. Reference to the rear or back of the panel or instruments relate to the mounting or terminal side.

b. Data.

Spotlight	Guide
Spotlight bulb	Model C3
Spotlight bulb candlepower.....	102½ (12-16 volts)
Dashlights	2
Dashlight bulb.....	Mazda 53
Dashlight bulbs candlepower.....	1, 12-16 volts
Windshield wiper (electric—12 volts).....	Bosch, WWA12B-143
Battery	Willard—RHD-19-6
Battery capacity.....	153 ampere hour
Voltmeter.....	(Range) 8-16 volts
Engine compartment heater.....	Stewart-Warner

HULL ELECTRICAL SYSTEM

127. TROUBLE SHOOTING.

a. No Current from Battery to Operate Lights or Accessories.

Possible Cause

Possible Remedy

(1) BATTERY DISCHARGED.

Light or accessory switch left on.

Replace or recharge battery either with battery charger or by starting engine with starting crank, and allowing engine to run sufficient time for generator to charge battery.

Short in wiring system due to frayed or broken cable.

Locate defective wire and replace wire or harness assembly.

Incorrect wiring hook-up.

Rewire according to wiring chart.

Defective battery.

Replace battery.

b. Light Bulbs Fail to Light.

Bulb defective.

Replace bulb.

Bulb terminals dirty or corroded.

Clean terminals.

Loose connections.

Tighten.

Defective switch.

Replace.

Bulb improperly installed.

Install correctly.

Battery discharged.

Replace or recharge battery.

c. Instruments Fail to Operate.

Battery discharged.

Replace or recharge.

Poor ground connection.

Clean and tighten connection.

Loose terminal connections.

Tighten connection.

Defect in unit.

Replace.

d. Accessories Fail to Operate or Operate Incorrectly.

(1) WINDSHIELD WIPER.

Battery discharged.

Replace or recharge.

Wiper runs hot.

Install new wiper.

Wiper arm and blade run slow.

Inspect wiper arm for tightness to body shaft.

128. BATTERY.

a. Description. The battery is a Willard, heavy-duty type, 12-volt, 6-cell, 19-plate, with a capacity of 153 ampere hours. It is equipped with the "safety fill" type caps for each cell to prevent overfilling. A heating unit incorporated in the engine compartment will, if operated as directed, protect the battery against freezing and insure maximum operating efficiency.

b. Removal of Battery. Remove the two thumb screws and clamps on the engine side panel, raise the lid about half way up, pull the lid from the hull lid slots, and remove from vehicle. Loosen the battery cable clamp

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Figure 130—Wiring Diagram

DEFROSTER

DEFROSTER SWITCH

W = WHITE R = RED
BR = BROWN G = GREEN
B = BLACK BL = BLUE

SPOTLIGHT

SPOTLIGHT SWITCH

STARTER PUSH BUTTON

FUEL GAGE

SOCKET

FUSE

WINDSHIELD WIPER MOTOR

SOCKET

COMPASS

INSTRUMENT PANEL LAMPS

INSTRUMENT PANEL LAMPS AND REAR MARKER LAMP SWITCH

IGNITION SWITCH

AMMETER

RESISTOR

VOLTMETER AND COMPASS LAMP SWITCH

VOLTMETER HEATER SWITCH

CIRCUIT BREAKER

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Figure 131—Wiring Diagram (enlarged section)

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nuts and pull the positive and negative clamps from the terminals, taking care not to damage the cell posts or cable clamps. Remove battery hold-down frame nuts and frame, and lift the battery from the vehicle.

c. **Cleaning of Battery.** Plug the vents in the cells and with a solution of soda ash (8 ounces to 1 gallon of water; or baking soda, 1 pound per gallon of water) wash the battery until all traces of acid, dirt or corrosion have been removed. Flush the case with cold water. Clean the cable terminals with the solution and, if necessary, use a wire brush or suitable tool to insure a clean, bright connection.

d. Inspection and Repair of Battery.

(1) Inspect the battery case for leaks or cracks, and determine specific gravity by a hydrometer reading. If the reading is below 1.280, recharge or replace the battery with one that is fully charged. If battery case is cracked, repair or replace battery.

(2) **FREEZING OF BATTERY SOLUTION.** A partially discharged battery may freeze in winter. Therefore, in cold weather, keep the battery fully charged, particularly if the vehicle stands in a cold place for any length of time. The freezing point of the electrolyte depends on its specific gravity. When fully charged, the electrolyte will remain liquid at extremely low temperatures. A fully charged battery, if it stands idle long enough, will discharge slowly to a point where freezing may ensue. If the vehicle is to be stored for a long time without heat in very cold weather, take the battery to a place where it can be serviced. Water which has been added to a battery and has not mixed with the electrolyte is likely to freeze if the battery is exposed to low temperature. When batteries have been frozen, they may be thawed by bringing them into a room kept at normal temperature (60 F to 70 F). The battery may be serviceable if the freezing has not continued too far. In discharged batteries the freezing points of electrolytes of various specific gravities are as follows:

Specific gravity	Freezing temperatures
1,220	-31 F (-30 C)
1,185	- 8 F (-22 C)
1,150	- 5 F (-15 C)
1,100	-18 F (- 8 C)
1,000 (water)	-32 F (0 C)

e. **Installation of Battery.** Install battery in engine compartment. Place battery hold-down frame in position, and install nuts and fasten securely. Do not tighten enough to distort the case. Coat the battery terminal posts and cable clamps with petroleum jelly or light grease, and install cable clamps on battery terminals. Tighten bolts securely. Place engine compartment lid in position, engage tongues of lid in slot in right side of hull coaming, lower the lid, tighten wing nuts securely.

HULL ELECTRICAL SYSTEM

129. WIRING HARNESS.

a. Description. The wiring is carried in two harnesses, a main wiring harness which contains the wiring to the instrument panel controls and gages (figs. 130 and 131), and related units in the engine compartment and an auxiliary harness connecting the generator to the voltage regulator.

b. Removal of Wiring Harness.

(1) **MAIN HARNESS.** Remove all terminal connections and conduit holding clips on the rear of the engine side panel. Remove terminal bolts on the voltage regulator. Remove harness holding clips from bulkhead. Disconnect rear marker light wire at socket inside hull and remove harness.

(2) **AUXILIARY HARNESS.** Remove terminal wires from generator and voltage regulator. Take off three clips holding the harness in place, and remove harness.

c. Inspection and Repair of Main and Auxiliary Harness. Inspect both the main and auxiliary wiring harness for evidence of worn or frayed coverings. Test the wires for proper current carrying capacity. If any wires are broken or a short is discovered, replace the entire harness.

d. Installation of Wiring Harness.

(1) **AUXILIARY HARNESS.** Install the harness in the holding clips and fasten securely. Fasten the wires to their respective terminals as indicated on the wiring chart (figs. 130 and 131), and tighten securely.

(2) **MAIN HARNESS.** Install all main harness holding clips and fasten securely. Make sure that connecting wire ends contact each other through connectors. Attach terminals in proper location as indicated on wiring chart (figs. 130 and 131) and tighten fastening screws securely.

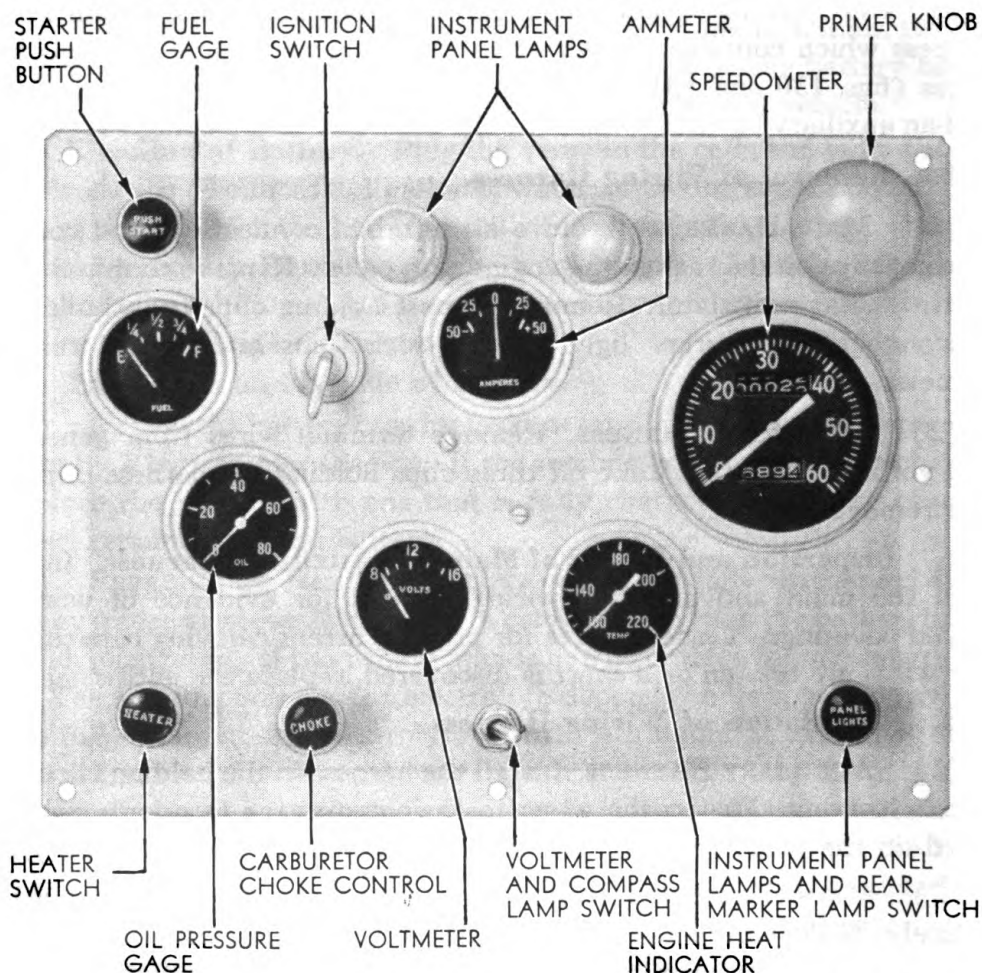
130. VOLTMETER.

a. Description (fig. 132). The voltmeter is used for testing voltage present in the electrical system. It is operated by moving the switch upward, and noting reading of the indicator needle. The needle should, after a slight delay for needle movement, register between 12 and 15 volts.

b. Removal of Voltmeter. Take off nut and lock and disconnect black wire from lower terminal post on the back of the instrument panel (fig. 133). Remove the clamp bracket stud nuts holding the voltmeter to the instrument panel. Pull the bracket off the studs and remove the voltmeter.

c. Inspection and Repair of Voltmeter. Test the voltmeter with suitable equipment for correct reading. If it registers incorrectly install a new voltmeter.

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Figure 132—Instrument Panel—Front

d. Installation of Voltmeter (figs. 132 and 133). Place voltmeter in position in panel, install stud nuts on clamp bracket, connect black wire to lower terminal post and tighten nuts.

131. COMPASS AND LIGHT.

a. Description. The compass is of the sealed liquid type, and is mounted directly in front of the driver, in a rubber-insulated bracket. A small light is located within the compass bracket, and is wired to the voltmeter switch.

b. Removal of Compass and Light. Remove the four screws on each side which hold the left and right side plates to the compass case. Disconnect the compass light wires by removing the plug from the lower socket on the engine side panel. Remove the compass mounting bracket to hull brace bolt, nut, and spacer at the compass bracket. Remove the

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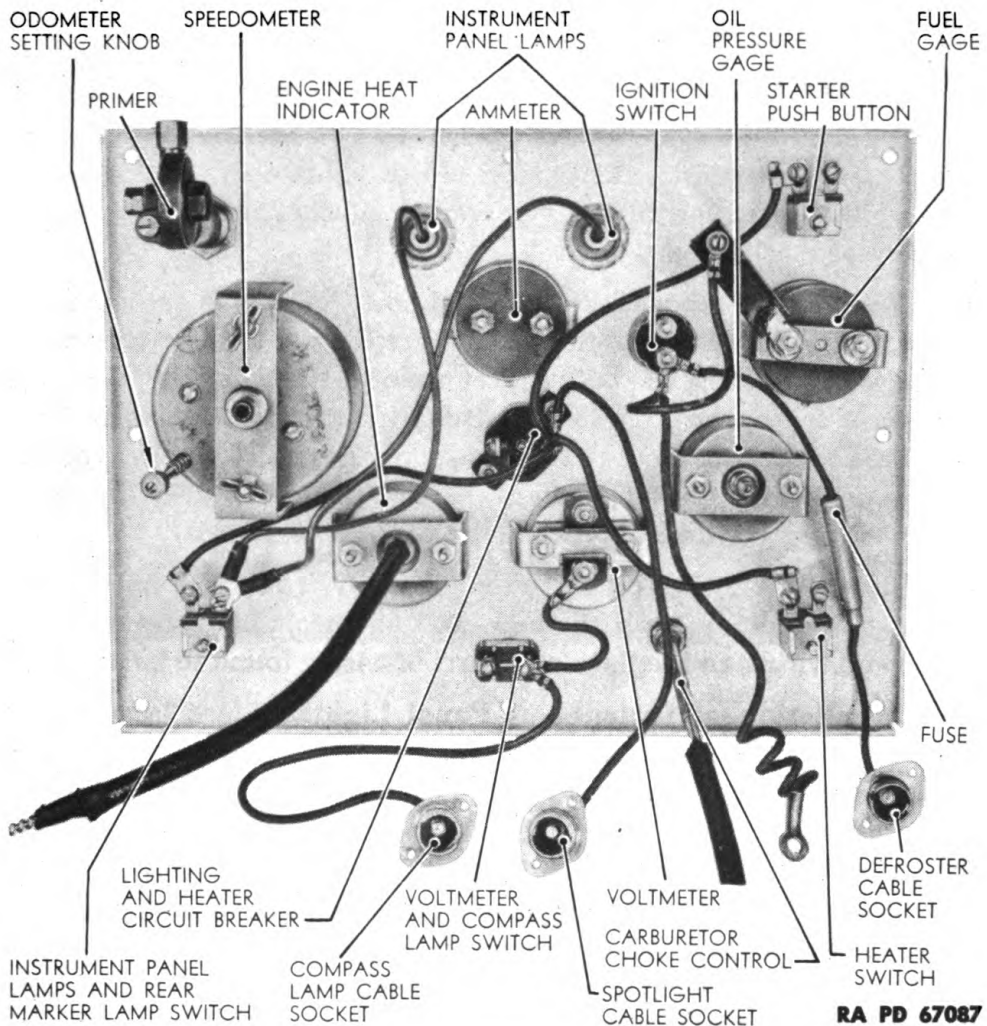


Figure 133—Instrument Panel—Rear

two rear nuts with locks and loosen the forward two nuts and locks that secure the compass mounting bracket to the hull coaming support bracket. The forward nuts should then be removed with the fingers while the entire assembly is held with the other hand.

c. Inspection and Repair of Compass and Light. If, when testing with a compass of known accuracy, the vehicle compass is found to be inaccurate, the matter should be referred to higher authority.

d. Installation of Compass and Light. Install the compass mounting bracket to hull brace with bolt nut and spacer. Install the two front nuts with locks that secure compass mounting bracket to hull coaming support bracket. Connect the compass light by installing the plug in the lower socket on the engine side panel. Install screws on each side which hold plate to compass case and tighten securely.

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132. INSTRUMENT PANEL LIGHTS.

a. Description (figs. 132 and 133). Two lights are located at the upper center of the instrument panel. Both lights operate by a switch located at the upper left of the instrument panel. This switch also operates the rear marker light.

b. Removal of Instrument Panel Lights. Remove the covers by pulling downward to spring the retaining spider out of the panel. To remove the bulb, spring the bulb socket out of the body or shield by pulling sidewise on the wire. Push in on the bulb, turn clockwise, and pull it from the socket. If the entire light assembly or wiring requires replacement, disconnect the green wire from the left terminal of the lamp switch before removing the assembly from the panel.

c. Inspection and Repair of Panel Lights. If the bulb fails to light, install a tested new bulb. If the new bulb fails to light, inspect the connections and wiring and replace any parts of wiring found to be defective.

d. Installation of Instrument Panel Lights. Place light bulb in socket, push in and turn counterclockwise and bulb will snap into place. Place covers over light bulb and push into place.

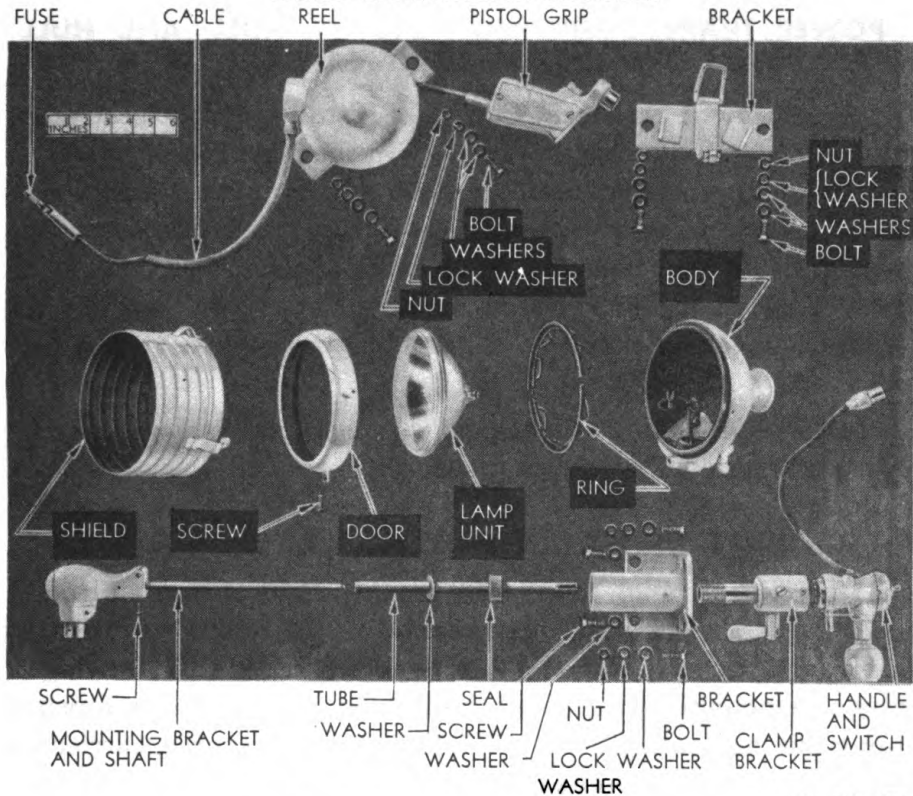
133. SPOTLIGHT.

a. Description. The spotlight is mounted on the front coaming. A control handle in the driver's compartment permits adjustment of the light over a wide frontal range. The light body can be removed and used as a trouble light.

b. Removal of Spotlight. Loosen the wing nut on lamp body, and remove spotlight from spotlight shaft.

c. Disassembly of Spotlight Body. Remove spotlight lens shield by lifting holding clips off studs, and remove shield. Remove the screw from bottom of spotlight rim, lift spotlight rim with bulb outward from light body and up to disengage it from light body. Disconnect wires from back of bulb and remove rim and bulb from light body. Remove bulb retainer ring from spotlight rim, and remove bulb from rim.

d. Removal of Spotlight Control. Remove spotlight cable from socket on engine compartment panel. Loosen the two screws at front end of shaft. Loosen socket head set screw on top of supporting bracket, located just ahead of windshield. Loosen wing nut on spotlight control shaft using a suitable tool, and unscrew inner shaft from outer bracket. Pull forward shaft into driver's compartment. Remove cap screws, lock washers and flat washers from spotlight bracket on top of hull coaming and remove bracket from vehicle.

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Figure 134—Spotlight and Trouble or Signal Light Parts

e. Disassembly of Spotlight Switch. Remove the jam nut holding switch assembly to the switch cover. Remove the screws holding the switch cover to control body, and remove cover. Remove the screws and clip holding the conduit and cable to control body. Pull switch assembly out of control body and remove the cable screw from switch. The cable and plug connector can be removed from the control body for inspection.

f. Cleaning, Inspection and Repair of Spotlight Parts. Remove grease or gum from gearing in control handle and at front end of control shaft, using SOLVENT, dry-cleaning. Inspect all gears for cracked or chipped teeth. Replace as necessary. Check all wire connections for breaks or other possible breakage. Replace as necessary. Examine spotlight bracket for cracks, repair or replace as necessary. Relubricate all gearing before assembly of parts.

g. Assembly of Spotlight Body Parts. Place spotlight bulb in rim and fasten securely by installing retainer ring and snap into place. Connect spotlight bulb wires to terminals on bulb. Install rim and bulb assembly to spotlight body by placing tongue of rim in slot at top of light body, install screw in headlight rim at bottom, and tighten securely. Install spotlight shield over front of light body, making sure that the sights are at the top. Place holding clips over studs on light body to hold it securely in place.

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h. Assembly of Spotlight Control. Install spotlight bracket to hull coaming by installing cap screws, flat washers and lock washers, and tighten securely. Install control handle and switch assembly to shaft. Using a suitable tool, screw the inner shaft to outer shaft bracket. Tighten the socket head set screw, set screw and wing nut at control handle securely. Tighten the socket head set screw at top of spotlight bracket located just ahead of windshield. Tighten the screws at front end of control shaft.

i. Install Spotlight Body. Install spotlight body assembly to mounting post and tighten the wing nut securely.

134. TROUBLE LIGHT CONTROL AND REEL.

a. Description (fig. 134). The trouble light spring-controlled reel and cable is carried in a housing fastened to the bulkhead directly back of the driver. The rear end of the cable is connected to the voltage regulator by a detachable socket, and the free end terminates in a pistol grip mounting for the spotlight body. The length of the cable, carried on the spring-controlled reel permits the use of the light both inside and outside the vehicle.

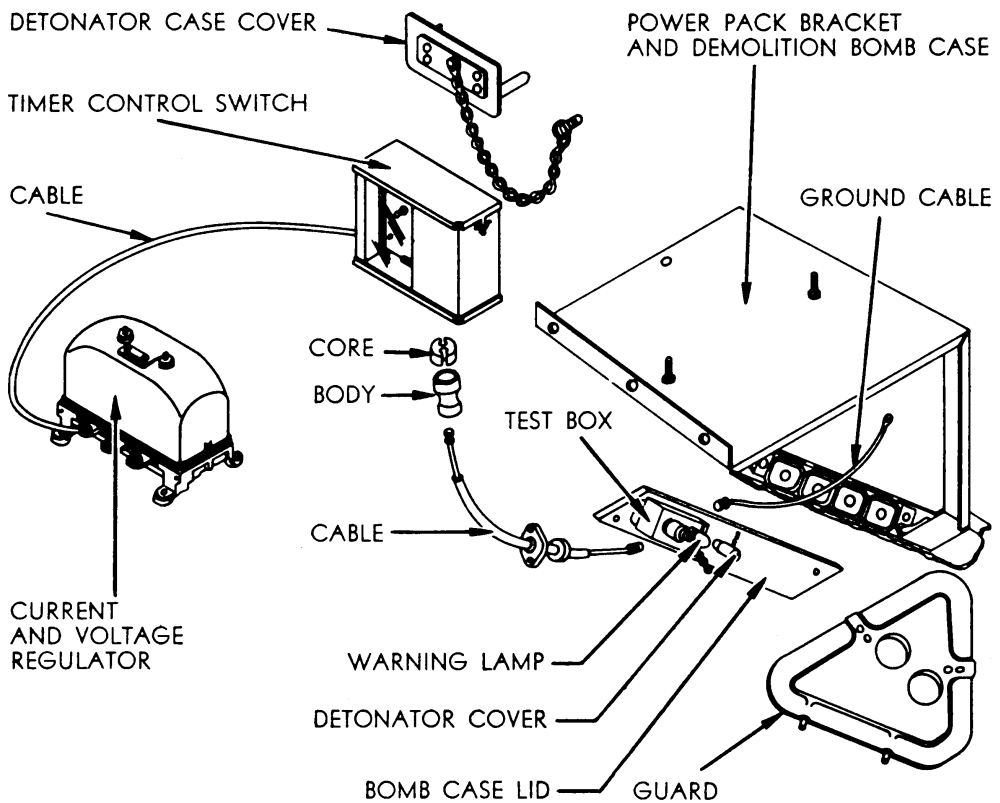
(1) REMOVAL OF LIGHT REEL AND PISTOL-GRIP. Remove the engine compartment lid. Remove nuts, flat washers, and lock washers holding the demolition timer box to the bulkhead (removal of the timer box is necessary to permit using a screwdriver to remove the wire grommet through engine side panel). Remove the screws in the cable grommet on the engine side panel. Remove light cable from fuse connector, and remove fuse inside the engine compartment. Take out the cap screws, flat washers and lock washers from the attaching bracket, and remove reel and cable assembly from the vehicle.

b. Disassembly of Trouble Light Reel and Pistol-grip. Remove the two pistol-grip side handle screws, and take off plate from pistol grip side. Remove two wire terminal screws which hold the wiring to pistol grip. The reel proper cannot be disassembled.

c. Inspection and Repair of Trouble Light Parts. Inspect the reel and control switch and, if defective, install a new switch or reel. Solder wire connections if broken. If faulty reel assembly is found, the reel is to be replaced as a unit, as no allowance is made for disassembly. The fuse housing should be inspected and if damaged, replace with a new fuse.

d. Assembly and Installation of Trouble Light and Reel. Attach the wires to the pistol-grip terminal screws, and install the side plate and pistol-grip handles. Position the cable through the cable grommet on the engine side panel. Attach the reel and cable housing to the attaching

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Figure 135—Demolition Equipment and Wiring

bracket on the bulkhead. Install the demolition timer box to the bulkhead. Install cable to fuse connector and install engine compartment lid.

135. BOMB CASE WARNING LIGHT.

a. When the bomb case warning light is burning it indicates a fault in the demolition equipment circuit, and the trouble should be reported to higher authority immediately (fig. 135).

136. ELECTRIC WINDSHIELD WIPERS.

a. **Description** (fig. 136). The vehicle is equipped with two single-speed independently operated electric wipers mounted on the inside of the hull, connecting arms, blades and linkage. The wiring connects the wiper body to the control switch through a plug-in socket connection mounted on the side panel.

b. **Removal of Windshield Wipers.** Pull the wire terminal end out of the forward junction post on the wiper body. Loosen the wiper arm fastening screws located at the end of the wiper arm operating shafts. Pull the arm out and off the wiper shaft. Remove the shaft and nut and pull off spacer. Remove bolts holding mounting brackets to coaming and remove bodies and linkage.

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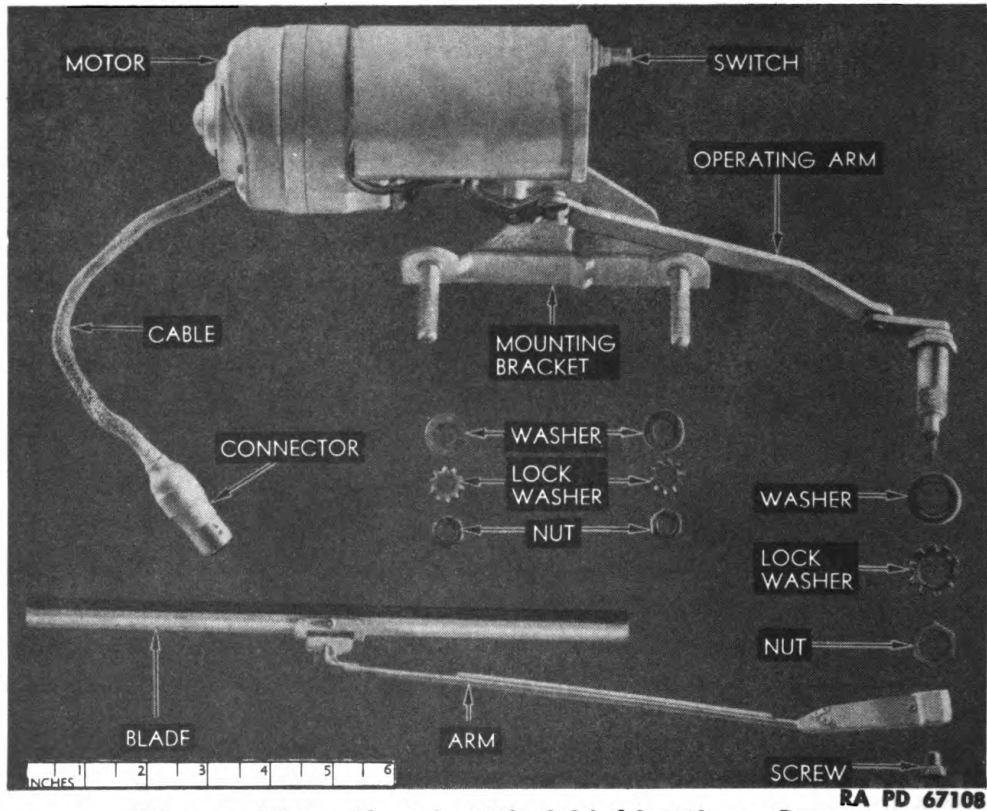


Figure 136—Electric Windshield Wiper Parts

c. Inspection and Repair of Wiper Motor and Parts.

(1) **INSPECTION AND REPAIR.** Before removal, inspect the wipers for proper arm and blade adjustment, quietness of operation, tightness of wiper arm motor shaft, and the wiring cable for proper contact at the forward junction post on the wiper motor. If the wiper motor is faulty, replace it. If the arm is loose on the shaft and cannot be adjusted by tightening of the fastening screw, install a new arm (fig. 136).

d. Installation of Windshield Wiper. Place wiper motors with linkage on mounting brackets at hull coaming. Install nuts and lock washers and tighten securely. Tighten wiper arm assemblies with the screws located at end of operating shafts. Install wiper cables by inserting wire terminal ends in connector sockets.

137. ACCESSORY SWITCHES AND CIRCUIT BREAKER.

NOTE: Removal instructions pertaining to all switches located on instrument and side panels and to the circuit breaker are predicated on prior removal of engine compartment lid, and with battery ground strap disconnected.

a. Voltmeter and Compass Light Switch.

(1) **REMOVAL OF SWITCH.** Loosen terminal screws and remove black

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wire from the lower post, and red wire from the upper terminal at the back of the switch. Remove the escutcheon nut and ring from the front of the switch. Push switch body out of the panel opening.

(2) **INSTALLATION OF SWITCH.** If a new switch is to be installed, transfer the jam nut onto the new switch body, and adjust the nut so that the switch body will be flush with the escutcheon nut when tight. Position switch in panel, install escutcheon ring and nut and tighten. Tighten jam nut and connect black wire to lower post, and red wire to the upper terminal.

b. Instrument Panel Light and Marker Light Switch.

(1) **REMOVAL OF SWITCH.** Loosen two terminal post screws on the back of switch body and remove two green wires and one blue wire from the right terminal and the black wire from the left post. Loosen the switch button set screw, and turn button counterclockwise off switch operating shaft. Remove lock nut holding switch body to instrument panel. Remove switch from rear side of panel. An internal lock washer is used between switch body and the rear side of the panel.

(2) **INSTALLATION OF SWITCH.** Place switch in position from rear side of panel, install internal lock washer between switch body and rear side of the panel. Install and tighten lock nut. Connect black and blue wires to the left terminal, and single black wire to right post. Install switch button by turning clockwise on operating shaft until tight, with identification name horizontal. Tighten the button set screw.

c. Spotlight Switch.

(1) **REMOVAL OF SWITCH.** Remove jam nut holding switch assembly to handle cover. Remove screws holding cover to control body. Remove cover. Remove screws and clips holding conduit and cable to control body. Pull switch out of control body and disconnect cable from the switch.

(2) **INSTALLATION OF SWITCH.** Connect cable to switch in control body, insert screws and clip holding conduit and cable to control body. Tighten securely. Install cover to control body, install jam nut and screw holding switch assembly to handle, tighten both securely.

d. Trouble Light Switch.

(1) **REMOVAL OF SWITCH.** Remove two handle side grips, the two black wires to switch terminal and pull them from the handle grip. Remove fiber block and attaching screw from the grip trigger, and take out two mounting bolts that anchor switch to handle inside housing. Remove switch assembly.

(2) **INSTALLATION OF SWITCH.** Install switch assembly to mounting studs in switch handle. Insert fiber block and attaching screws to the grip trigger, and tighten screws. Connect the two black wires to switch terminal, and insert in handle grip. Replace the two handle side grips.

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e. Windshield Wiper Switch.

(1) **REMOVAL OF SWITCH.** Remove the two shield cover screws, and unsolder the two wires from the switch. Remove the switch jam nut and remove the switch from the shield cover.

(2) **INSTALLATION OF WIPER SWITCH.** Install shield cover to switch and install jam nut. Solder the two wires to switch. Make sure the ground black wire is tight on the shield anchor bolt.

f. Ignition Switch.

(1) **REMOVAL OF SWITCH.** Loosen two wire terminal nuts and remove switch body attaching nut by turning counterclockwise. Remove switch from panel by pushing through instrument panel.

(2) **INSTALLATION OF SWITCH.** Insert switch into instrument panel. Connect the two wire terminal nuts, and install switch body by holding nut and turning clockwise.

g. Starting Motor Switch (push button).

(1) **REMOVAL OF STARTING MOTOR SWITCH.** Loosen terminal post screw on back of switch, pull off brown wire having spade type terminal end, and remove black wire from other terminal. Loosen button set screw and remove button by turning it counterclockwise off switch operating shaft. Remove lock nut holding switch body to instrument panel. Remove switch from panel.

(2) **INSTALLATION OF STARTING MOTOR SWITCH.** Place switch in panel with internal lock washer between switch body and instrument panel. Install lock nut and tighten. Install switch button by turning clockwise on operating shaft until tight; then back off until identification name is horizontal, and tighten set screw in button. Connect brown wire to left terminal and black wire to right terminal.

h. Circuit Breaker.

(1) **REMOVAL OF CIRCUIT BREAKER.** Disconnect two wire terminal screws and remove the nuts, lock washers and bolts that hold the circuit breaker to the instrument panel.

(2) **INSTALLATION OF CIRCUIT BREAKER.** Install circuit breaker to the instrument panel. Connect the two black wires to right side, and single black ammeter wire to left side. Replace lock washers and nuts and tighten securely.

138. MARKER LIGHT.

a. Description (fig. 137). The single-bulb, blackout type, rear marker light is connected in the instrument panel light circuit. It lights only when the instrument panel switch is pulled out. It is adequately sealed to prevent the entrance or accumulation of moisture within the body.

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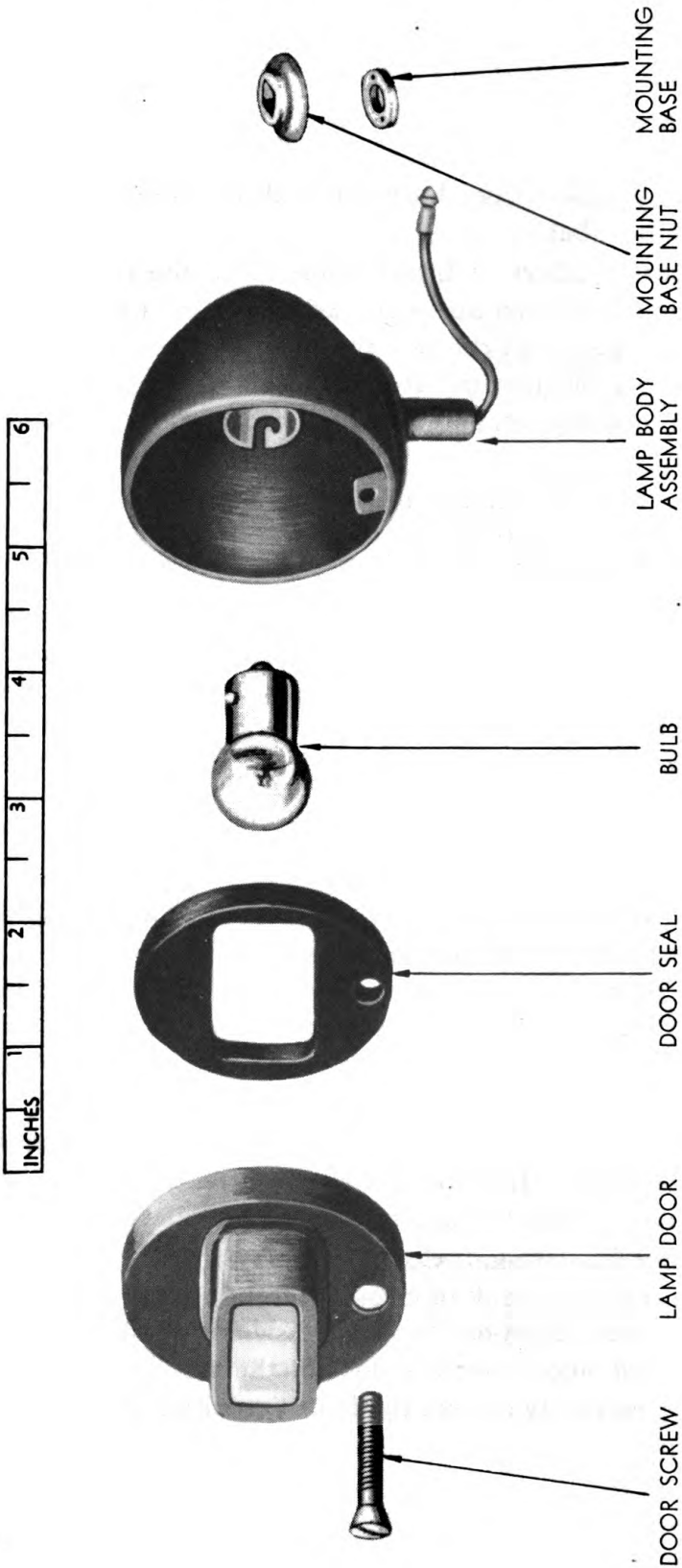


Figure 137—Parts of the Rear Marker Light

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b. Removal of Marker Light.

(1) **REMOVE BULB ONLY.** Remove the light door screw near the bottom of the door and lift the door and rubber gasket out at the bottom and upward off the light body. Turn the bulb counterclockwise and pull it out of the bulb socket.

(2) **REMOVE MARKER LIGHT BODY.** Pull the blue wire out of the Douglas terminal located inside the left rear corner of the hull. Pull the wire with covering loom through the hull. Unscrew ferrule at the light, and slip end loop off the wire. Remove the hull to light body bracket nut and internal lock washer, and lift the light assembly and wire out of the bracket hole.

c. Inspection and Repair of Marker Light Parts. If the inspection reveals a burned-out bulb, defective or shorted wiring or broken terminals, the entire light assembly should be replaced.

d. Installation of Marker Light Parts. Replace light wire by inserting it through the hull coaming at the rear of the vehicle in the left side. Install light body to bracket, attach wire, install the nut and internal lock washer, and tighten securely. To install bulb push in and turn clockwise into position. Install light door with rubber gasket, insert the screw and tighten securely.

139. GASOLINE GAGE.

a. Removal of Gasoline Gage Dash Unit. Loosen engine compartment lid wing nuts, lift lid and disengage tongues from slots in coaming and remove lid from vehicle. Take off two terminal nuts and lock washers from back of gage. Remove resistor from left terminal, and red wire from right post. Remove two nuts holding gage to panel. Pull off U-clamp on terminal posts and remove gage from panel.

b. Removal of Tank Unit. Remove terminal nut and washer holding electrical wire to unit. Disconnect fuel line at flexible coupling. Take out five screws holding unit to tank, and lift entire unit from tank.

c. Testing Fuel Gage. Connect the electrical wire, removed from the old tank unit, to a tank unit known to be accurate. Ground the test unit to the vehicle. Turn on the ignition switch (dash unit in instrument panel) and raise and lower the float of the test unit. If the dash unit registers approximately correct the fault lies within the old tank unit and a new one should be installed. If, however, raising or lowering the float of the test unit has no effect on the dash unit the trouble lies in the dash unit or wiring. Install a new dash unit and test as outlined above.

d. Installation of Gasoline Gage Dash Unit. Place gage in position in panel, place U-clamp in position, and install nuts holding gage to panel.

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Install resistor on left terminal and red wire on right. Tighten nuts securely.

140. SPEEDOMETER.

a. **Speedometer Head Removal.** Loosen wing nuts holding lid in position, lift lid up and disengage tongues from slots in coaming, then remove lid. Remove cable connector nut from speedometer body. Take off wing nuts, lock washer and bracket from back of speedometer, and remove assembly from front of instrument panel.

b. **Installation of Speedometer Head.** Place speedometer head in position in instrument panel. Place support bracket in position, install lock washers and wing nuts. Attach speedometer cable and tighten connector nut. Install engine compartment lid and tighten wing nuts.

c. **Speedometer Cable Removal.** Remove engine compartment lid. Remove cap screws holding floor pan and remove floor pan. Disconnect cable and core at speedometer head. Loosen clips holding cable and core in position. Disconnect cable and core at axle unit and remove from vehicle.

d. **Inspection of Speedometer Cable.** Examine cable and core for breaks at connecting ends of core. Hold cable with one end up and with an oil can place a few drops of oil on the core and allow it to run down the core. Do not over-oil.

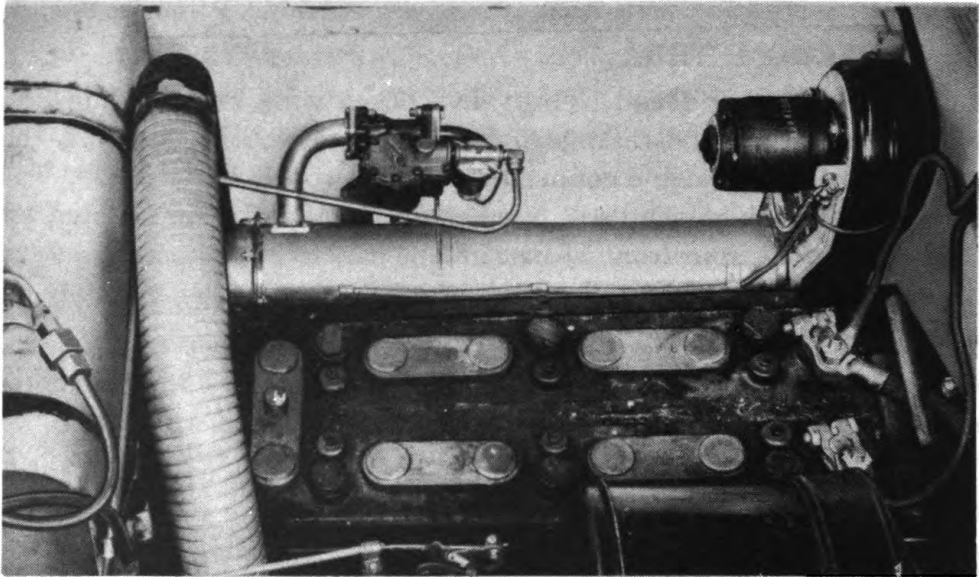
e. **Installation of Speedometer Cable.** Place the cable and core in position in hull. Insert core connection in axle unit adapter and install and tighten cable connector nut. Thread cable assembly through hull and engine compartment, fasten cable in clips on right side of hull and install and tighten connecting nut to speedometer head. Install hull floor pan and engine compartment lid.

141. ENGINE COMPARTMENT HEATER.

a. **Description (fig. 138).** The "stand-by" heater is provided to warm up the engine compartment during extremely cold weather. The heater burns regular vehicle fuel which is fed through a carburetor to the combustion chamber, where it is ignited by a glow plug. The glow plug is automatically controlled by a bi-metal switch incorporated in the igniter unit. The heater is to be used only when the engine is not running.

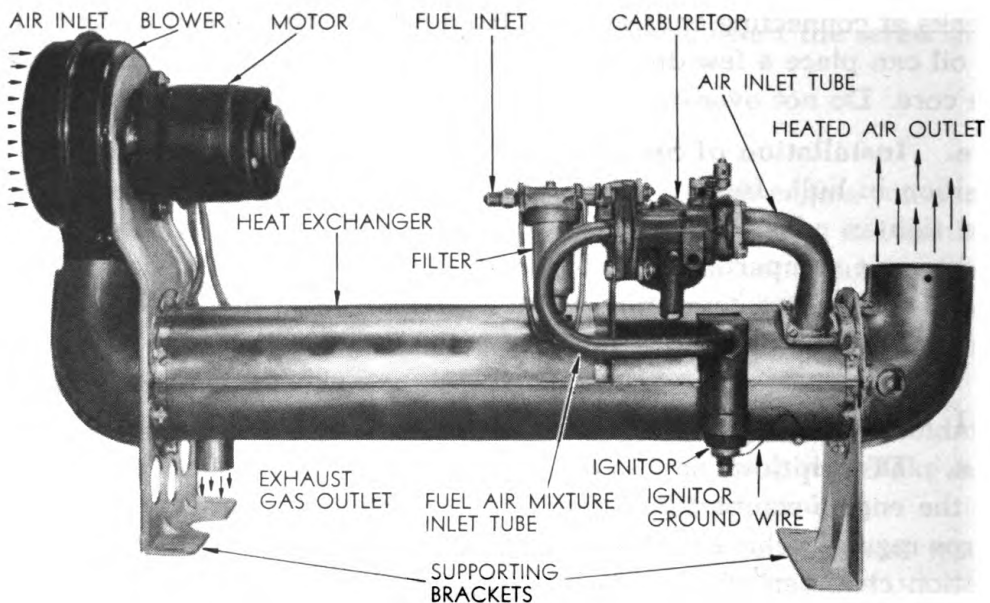
b. **Removal of Heater.** With fuel valve in closed position disconnect fuel line at valve fitting, and at fuel intake on heater. Remove bolt holding flexible air outlet tube sleeve to heater, and pull sleeve out of heater air outlet. Remove clip bolt nut and lock washer from battery bed frame, and lift air outlet tube from vehicle. Disconnect wire from terminal on blower end of heater. Take off nuts and lock washers from heater mount-

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**Figure 138—"Stand-by" Heater Location Within
Engine Compartment**



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Figure 139—"Stand-by" Heater

ing studs and lift heater, with exhaust gas outlet tube assembled to heater, out of vehicle.

c. Disassemble Heater (fig. 139).

(1) **REMOVE IGNITER.** Remove screw and lock washer holding igniter ground wire to heater case. Remove two nuts holding electrical lead on

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igniter terminal. Remove lead. Remove igniter and gasket from igniter well.

(2) **REMOVE FILTER.** Grip filter assembly with hand and turn until it can be removed.

(3) **REMOVE CARBURETOR.** Remove safety wire and four screws holding carburetor to air intake tube. Remove safety wire and four screws holding air intake tube to heater case. Take off air intake tube and gaskets. Remove two bolts and boot nuts holding carburetor to fuel-air mixture delivery tube. Lift off carburetor and gasket.

(4) **REMOVE BLOWER AND MOTOR.** Take off nut holding blower motor lead and igniter switch lead to main terminal of heater. Remove leads. Remove screw and boot nut holding blower motor ground lead to heater case, and remove ground lead. Take off three nuts and six washers holding blower motor mounting plate to heater mounting plate. Pull blower motor off blower housing studs, and lift blower motor and blower wheel as a unit out of blower housing. Loosen set screw holding blower wheel on shaft of motor. Remove blower wheel. Remove screws and boot nuts holding intake elbow and mounting plate to heater. Lift intake elbow, blower housing, and mounting plate from heater. Slide blower housing out of intake elbow. Remove igniter switch lead from clips on outer case of heater. Pull igniter switch out of housing. Take off screws and boot nuts holding exhaust elbow (ventilating air) and mounting plate to heater. Remove exhaust elbow and mounting plate.

d. Inspect and Repair Heater Components.

(1) **DISASSEMBLE AND INSPECT CARBURETOR.** Remove screws and lock washers holding cover to float bowl and lift off cover and gasket. Remove float lever pin and lift off float. Remove inlet needle and spring. Remove inlet needle seat. Remove inlet needle screen. Remove large body channel plug screw. Unscrew main fuel jet and remove body channel plug gasket. Unscrew and remove nozzle. Remove adjusting screw packing nut. Remove adjusting screw.

e. **Cleaning Carburetor.** In order to clean the carburetor it should be completely disassembled. Wipe out the float bowl. Use high-pressure air stream on all channels. **CAUTION:** When blowing out inlet channel, cover opening. Do not lose the inlet screen.

f. **Reassemble and Adjust Carburetor.** Replace nozzle. Seat firmly. Replace gasket. Replace main fuel jet. Replace large body channel plug screw. Replace adjusting screw and adjust carburetor. Turn screw to the right until it seats. Do not force, as this may injure the casting. Turn screw $\frac{7}{8}$ of a turn to the left. This adjustment should be satisfactory for altitudes up to 5000 feet. In high altitudes, it may be necessary to make the mixture leaner by turning screw still farther to the left. Turning

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adjusting screw "in," or to the right, lessens the amount of air bled into the nozzle, and results in a richer mixture. Turning screw "out," or to the left, results in a leaner mixture. Replace adjusting screw packing nut. Replace inlet screen. Make sure it is not dirty or clogged. Replace inlet needle seat, needle and spring. See that needle closes the valve when seated. Test by holding needle in seat and blowing through inlet channel. If needle is worn, or does not seal opening, install new needle. Replace float and insert lever pin. Turn float bowl cover upside down so that float lever rests on inlet needle spring. Center of float should just touch a $\frac{3}{16}$ -inch round rod lying across float bowl cover. Bend lever to secure this adjustment. Replace float bowl cover and gasket. Tighten screws.

g. Disassemble Filter. Remove filter bowl and clean out sediment and moisture. Clean plate filters with compressed air. Reassemble filter.

h. Blower Motor. If blower motor is defective it must be replaced with a new blower.

i. Igniter. If the igniter or glow plug fails, a new one must be installed.

j. Heat Exchanger. Low heat output indicates a fouled heat exchanger and a new heat exchanger should be installed.

k. Reassemble Heater. Place exhaust gas outlet elbow (ventilating air) and mounting plate in position on heat exchanger. Replace screws and boot nuts. Tighten securely. Slide blower housing into intake elbow. Place blower housing and intake elbow in place on heater mounting plate, and as an assembly place the blower housing, intake elbow and heater mounting plate on the heat exchanger. Replace screws and boot nuts. Install blower wheel on motor shaft. Tighten set screws. Place washers on mounting studs and place blower motor and blower wheel as an assembly on studs of blower housing (blower wheel in housing and blower motor bracket on studs of housing). Install and tighten nuts. Place carburetor and new gasket in position on fuel-air mixture delivery tube. Replace bolts and boot nuts. Place intake tube and new gaskets in position on carburetor and heat exchanger. Install screws and safety wire. Install filter on carburetor. Install and tighten nuts. Place igniter and new gasket in igniter well. Push igniter switch into housing. Run long lead through clips on case and place on main terminal. Place short lead from igniter switch on igniter, replace nuts and washers and tighten. Place igniter ground lead in position on case. Replace screw. Place blower motor lead on main terminal of heater. Replace nut and lock washer and tighten. Place ground lead of blower motor in position on case. Replace screw and boot nut.

l. Installation of Heater. With exhaust gas outlet tube assembled to heater, place heater in position on mounting studs, install lock washers

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and nuts and tighten securely. Push heated air outlet tube in position and push bolt through hole in heater air outlet and sleeve, install lock washer and nut. Push air outlet tube alongside manifold and toward bottom of hull and fasten holding clip to battery bed frame. Connect wire to terminal at blower end of heater and connect fuel line to fittings on heater and tank valve.

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CHAPTER 6
SPECIAL TOOLS AND REFERENCES

Section I

SPECIAL TOOLS

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Special tools	142

142. SPECIAL TOOLS.

a. Transmission.

Tool Name	Number
Eyebolt, engine-lifting	J-3614
Puller, universal	J-3635
Body	J-3635-1
Screw	J-3635-2
Washers	J-3635-3
Studs $\frac{3}{16}$ —16NC (2) x 7	J-3635-4
Studs $\frac{3}{16}$ —16NC (2) x 12	J-3635-5
Studs $\frac{7}{16}$ —18NC (2) x $3\frac{3}{4}$	J-3635-6
Pins $\frac{1}{8}$ x $1\frac{5}{8}$	
Remover and replacer, reverse idler gear bushing . . .	J-3806
Remover, with adapters, front and rear bearing . . .	J-3641
Replacer, transmission pinion bearing	J-3803
Replacer, transmission rear flange oil seal	J-3804
Yoke, transmission pinion thrust	J-3643

b. Propeller Shaft.

Clamp, universal joint assembly	J-3620
Body	J-3620-1
Button	J-3620-2
Swivel	J-3620-3
Adapter	J-3620-4
Screw	J-3620-5
Handle	J-3620-6

c. Controlled Differential and Two Speed Transmission Assembly.

Guide pins, controlled differential to carrier assembly	J-3610
Puller, differential bearing	J-3634
Puller	J-3634-1
Plug	J-3634-2
Plate	J-3634-3
Bolts $\frac{3}{8}$ —16NC (2) x 4	

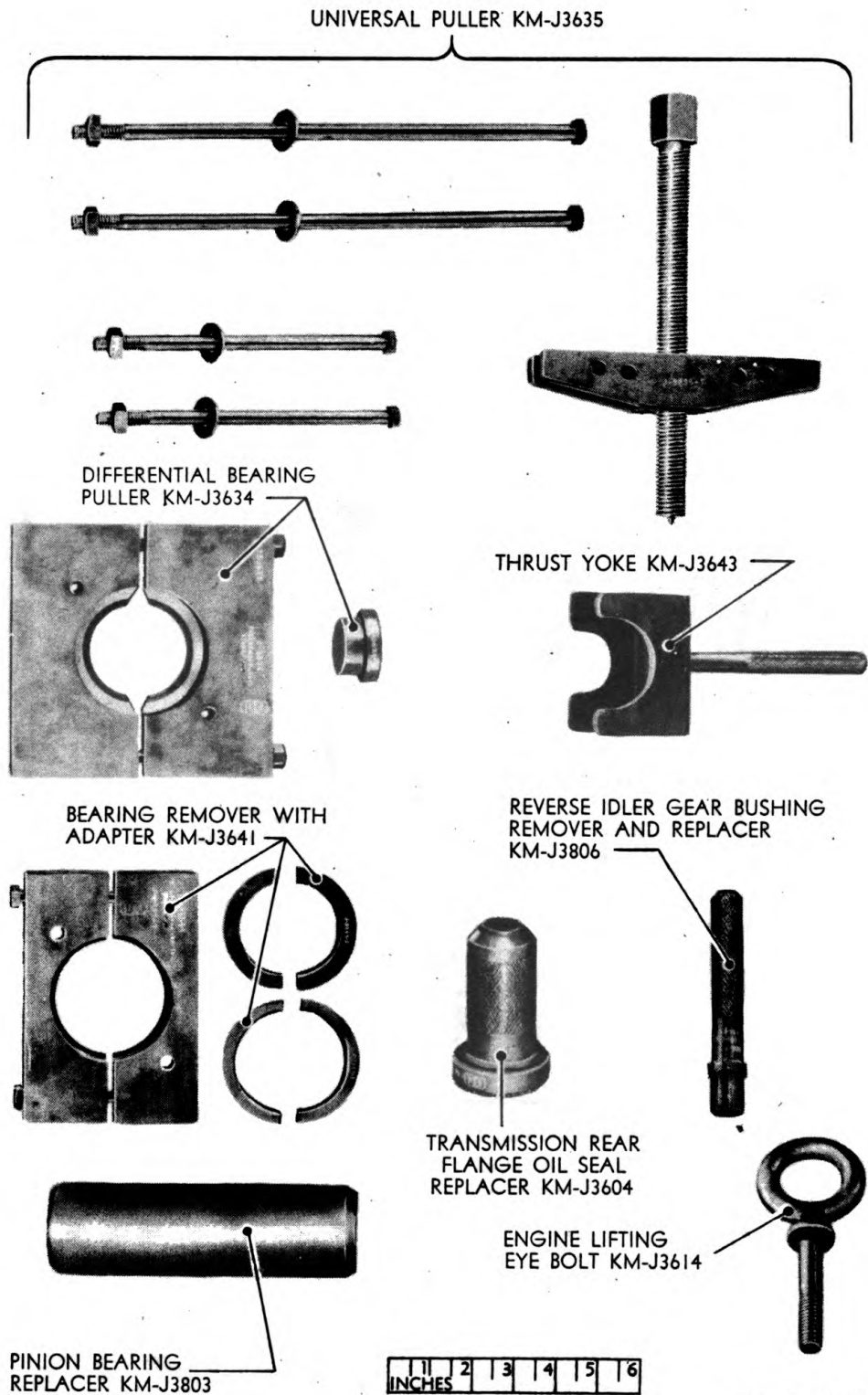
SPECIAL TOOLS

Tool Name	Number
Remover and Replacer, axle differential planet pinion bushing	J-3637
Remover, pinion inner bearing cup	J-3628
Plug	J-3628-1
Handle	J-3628-2
Remover, pinion outer bearing and mainshaft inner bearing cups	J-3630
Plug	J-3630-1
Handle	J-3630-2
Remover, two-speed transmission pinion outer bearing and retainer	J-3640
Disk	J-3640-1
Bolts $\frac{3}{8}$ —16 x 3	
Bolt $\frac{1}{2}$ —13 x 2 $\frac{1}{2}$	
Replacer, axle differential final drive gear bushing . .	J-3639
Handle	J-3639-1
Plug	J-3639-2
Replacer, axle differential housing bearing cone . . .	J-3632
Ring	J-3632-1
Plug	J-3632-2
Replacer, differential pinion outer bearing cone and planet gears	J-3631
Replacer, pinion inner bearing cone and Remover, mainshaft outer bearing cone	J-3625
Replacer, pinion inner bearing cup	J-3627
Plug	J-3627-1
Handle	J-3627-2
Replacer, pinion outer bearing and mainshaft inner bearing cups	J-3629
Plug	J-3629-1
Handle	J-3629-2
Replacer, transmission mainshaft oil seal	J-3621
Replacer, transmission mainshaft outer bearing cone	J-3622
Replacer, transmission mainshaft outer bearing cup	J-3624
Sling, controlled differential and two-speed transmission lifting	J-3802
d. Suspension System.	
Anvil, riveting	J-3648
Body	J-3648-1
Handle	J-3648-2
T-bar $\frac{3}{8}$ x 3	

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Tool Name	Number
Punch, rivet-setting	J-3647
Head	J-3647-1
Handle	J-3647-2
Replacer, bogie wheel support housing bearing cup	
Replacer, bogie wheel supporting housing seal	
Replacer, crank arm bushing	J-3604
Plug	J-3604-1
Handle	J-3604-2
Replacer, front wheel carrier assembly oil seal	J-3636
End	J-3636-1
Guide	J-3636-2
Spacer	J-3636-3
Replacer, inner wheel bearing cup	J-3609
Body	J-3609-1
Handle	J-3609-2
Replacer, outer wheel bearing cup	J-3608
Body	J-3608-1
Handle	J-3608-2
Replacer, track guide wheel hub needle bearings . . .	J-3613
Shaft	J-3613-1
Holders	J-3613-2
Nuts $\frac{3}{8}$ —16NC2	
Wrench, drive wheel bearing lock nut	J-3603
Handle	J-3603-1
Socket	J-3603-2

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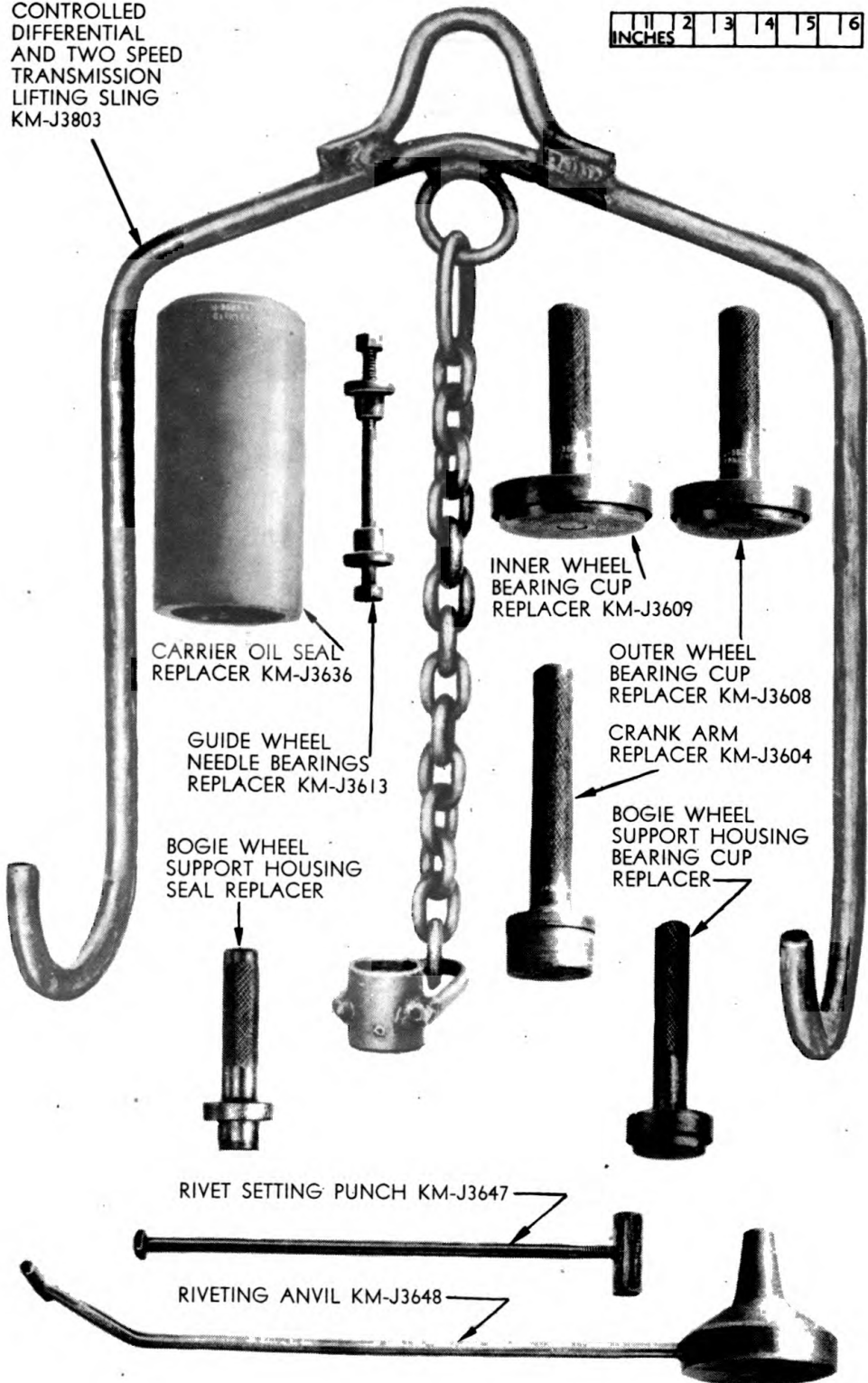
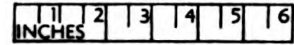


RA PD 67250

Figure 140—Special Tools and Equipment

**ORDNANCE MAINTENANCE
POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**

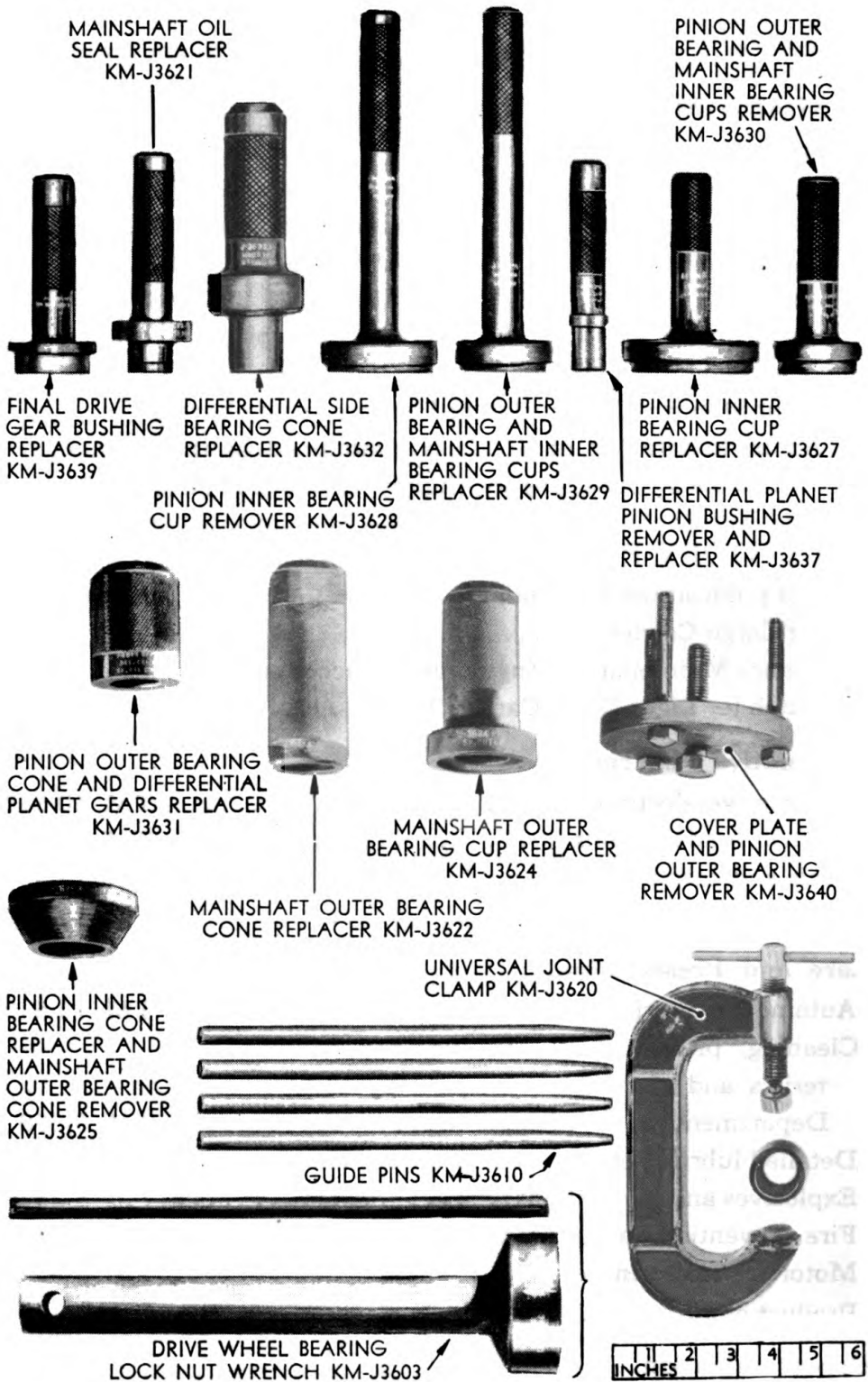
CONTROLLED
DIFFERENTIAL
AND TWO SPEED
TRANSMISSION
LIFTING SLING
KM-J3803



RA PD 67251

Figure 141—Special Tools and Equipment

SPECIAL TOOLS



RA PD 67252

Figure 142—Special Tools and Equipment

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POWER TRAIN, SUSPENSION SYSTEM, HULL, AND HULL
ELECTRICAL SYSTEM FOR LIGHT CARGO CARRIER T24**

REFERENCES

STANDARD NOMENCLATURE LISTS.

Carrier, cargo, T24 (Studebaker)	SNL G-179
Cleaning, preserving and lubrication materials, recoil fluids, special oils, and miscellaneous related items . .	SNL K-1
Soldering, brazing, and welding materials, gases, and related items	SNL K-2
Tools, maintenance for repair of automotive vehicles . .	SNL G-27
Tool sets—motor transport	SNL N-19
Current Standard Nomenclature Lists are listed above.	
An up-to-date list of SNL's is maintained as the "Ordnance Publications for Supply Index"	
	OPSI

EXPLANATORY PUBLICATIONS.

List of publications for training	FM 21-6
Light Cargo Carrier T24	TM 9-772
Ordnance Maintenance: Engine, engine accessories and clutch for Light Cargo Carrier T24	TM 9-1772A

Automotive Materiel.

Automotive electricity	TM 10-580
Electric fundamentals	TM 1-455
Fuels and carburetion	TM 10-550
The motor vehicle	TM 10-510

Care and Preservation.

Automotive lubrication	TM 10-540
Cleaning, preserving, lubricating, and welding ma- terials and similar items issued by the Ordnance Department	TM 9-850
Detailed lubrication instructions for ordnance materiel	OFSB 6-Series
Explosives and demolitions	FM 5-25
Fire prevention, safety precautions, accidents	TM 10-360
Motor transport inspections	TM 10-545
Product guide	OFSB 6-2

Decontamination.

Chemical decontamination materials and equipment . .	TM 3-220
Decontamination of Armored Force vehicles	FM 17-59
Defense against Chemical attack	FM 21-40

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Maintenance and Repair.

Automotive power transmission units.....	TM 10-585
Echelon system of maintenance.....	TM 10-525
Maintenance and care of pneumatic tires and rubber treads	TM 31-200
Maintenance and repair.....	TM 10-520
Ordnance maintenance procedure: materiel inspection and repair	TM 9-1100
Sheet metal work, body, fender, and radiator repairs..	TM 10-450

Storage and Shipment.

Registration of motor vehicles.....	AR 850-10
Rules governing the loading of mechanized and motor- ized army equipment, also, major caliber guns, for the United States Army and Navy, on open top equip- ment published by Operations and Maintenance De- partment of Association of American Railroads.	
Storage of motor vehicle equipment.....	AR 850-18
Ordnance field service storage and shipment Chart— group G major items.....	OSSC-6

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(A.G. 300.7 (23 June 43))

BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

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The Adjutant General.

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(For explanation of symbols, see FM 21-6)

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